

SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in
Electronics and communication Engineering

by

KARAMBIAM SREEKANTH SREEKAR (Register No. 37130186)

VAKA VENKATA BHARGAVA REDDY (Register No. 37130423)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119**

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **KARAMBIAM SREEKANTH SREEKAR** (Reg. No. 37130186) and **VAKA VENKATA BHARGAVA REDDY** (Reg. No. 37130423) who carried out the project entitled "**SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT** " under our supervision from December 2020 to April 2021.

Dr.P. GRACE KANMANI PRINCE

Internal Guide

Dr. RAVI

Head of the Department

Submitted for Viva voce Examination held on_____

Name:

Signature:

Internal Examiner

External Examiner

DECLARATION

We **KARAMBIAM SREEKANTH SREEKAR** (Reg. No. 37130186) and **VAKA VENKATA BHARGAVA REDDY** (Reg. No. 37130423) hereby declare that the Project Report entitled “**SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT**” done by us under the guidance of **DR.P. GRACE KANMANI PRINCE** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and communication Engineering.

1.

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DATE:

PLACE:

SIGNATURE OF THE CANDIDATES

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ABSTRACT

The project deals all with the method of monitoring the soil, from the manual to the smart or dynamic irrigation process. This results in greater convenience, efficient water use and less human monitoring effort. This project provides a cloud-based Internet of Things infrastructure and Arduino Uno control system. The watering requirement can be modified in this method for a soil by controlling the soil humidity. The measurement of plant ground moisture provides knowledge whether the plant is watered, watered or underwatered preferably. A plant ph measurement gives information on the soil's alkaline or acidic weather, depending on the mineral value provided to the soil. The proposed device tracks the soil moisture, moisture, temperature and ph. All data are tracked and monitored continuously via GSM into the IoT cloud. In the cloud, the data from the device is analysed and an action is sent accordingly from the cloud when a target level for soil moisture and PH is reached. In order to implement the system control unit, an arduino uno microcontroller is used. IoT is used to maintain the status of the garden owner updated. Sensor information is constantly updated on an IoT cloud and the end user is still able to verify the status. The sensor readings can be checked from any mobile or PC connected to the connection provided.

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CHAPTER 1

INTRODUCTION

Now in today's world, people are still really linked to the internet during their job execution. In the last few years, much more technology has taken hold and developed to monitor the quality of soil in the field of gardening. Certain IOT devices have been developed which are used in soil, which automatically gives the soil water and improves crops based on its colour and appearance. The key motor of the project is to tell the end user who operates the device about soil quality. The current IOT system is also run on sensors of the weather where all sensor readings are observed. The soil, air moisture and temperature, ph and water pumps are all moisturising with the weather sensors used. This project provides many benefits for users who are very interested in plant development. This research is mainly motivated by the use of IOT hardware components to build an IOT-enabled collection. The problem statement for the project is to incorporate a soil information kit that observes the day-to-day soil monitoring. In the future, the collected information can be more used. Monitored soil information or soil status may be monitored through a smartphone or personal computer.

1.1 AIM OF THE PROJECT

This project aims mainly at improving the agricultural output and reducing labour efforts, which have led to significant innovations in the human history. Nonetheless, in all these import times the high population rate has never allowed demand and supply to balance.

This project is why smart soil quality control is introduced for gardening using iot. The temperature, humidity, soil humidity, pH value of the soils using sensors can be continuously monitored in this process depending on these values, water flow can also be regulated through IOT and the pH of the soil. This means that water is used efficiently and the production is increased with less human effort.

1.2 EXISTING SYSTEM:

- In this existing system, they have only calculated the soil moisture value and humidity values.
- In the existing models if the moisture of the soil is reduced then the alert will be generated so the user will switch on the water supply.
- The system will be restricted to the particular area so the user will need to be available to check the system performance.

1.3 PROPOSED SYSTEM:

- In the proposed system, we are calculating the soil PH value and rain condition.
- The system operation will be monitored cloud so we can check the values like moisture, PH value from anywhere.
- An automatic system is established so whenever the soil is in dry state the motor will automatically ON.
- The user will not need to monitor the garden every time by his own, he can check the values from anywhere using cloud.

CHAPTER 2

LITERATURE SURVEY

In the contact with the controller, Angel C and Asha S[1] focused on reducing energy consumption by the sensors. For the study, the sensors such as Soil ph Sensor, Moisture Sensor and so on were used. Based on the data sensed and taken, the device decides on the appropriate irrigation action and also calls on the end user.

This solution would boost the garden that is truly beneficial to the modern world with water that has become a significant resource in recent years. In the system they suggested[2], Baltej Kaur, Danish Inamdar, essentially employed an android mobile application to monitor the system automatically. In order to track the soil condition, the different sensors such as humidity, temperature and soil are positioned on the ground. The information collected by the sensors is transferred to the mobile app using the controller based on soil conditions. User functions like irrigation controls, space views, personalised diagrams, real-time data access, remote access warnings and plant models can help build an intelligent user-friendly system.

Karan Kansara¹, Vishal Zaveri¹[3] use the key approach in their research: to save the end-user both time and money and power. Automatic control instead of manual was used in conventional gardening techniques. Work efforts can be minimised by automated irrigation control. Whenever the temperature shift is dramatic, the humidity in the environment senses a change in temperature, moisture and gives the microcontroller some signal. The drip can be automatically and manually operated.

SIZINI E. A. Saifullah, S. Han and M. Gidlund U.Jennehag SIZINI E. The research on the Internet of Things plays a major role in Internet connectivity and turning ordinary objects into smart devices A. Saifullah, S. Han, U.Jennehag, and M. Gidlund[4]. The latest IoT changed the interaction between people and their surroundings. These advantages not only serve consumers but also industrial purposes very appealing. In recent years, the

IoT model has played a significant role in the industry marketplace with deliberately constructed solutions.

The author's approach is: agriculture plays a key role in RN Rao, B Sridhar[5]

The agriculture was always the key to the country's growth. Smart farming by modernising conventional methods of farming is the only solution to this issue. The proposed method is therefore intended to make agriculture smart with automation and IoT. Things' Internet (IoT) enables different applications to track and pick crop growth and support irrigation decisions.

In the current situation, growing organic home-grown plants for health and safety is becoming increasingly essential for many people, writes author P Jariyayothin, K Jeravong [6]. But others have no time to care for the plants. The IoT Backyard system for monitoring and control of watering of domestic plants is therefore introduced in this project. We use the Internet of things (IoT) and inexpensive technology with a water tank with tap and emphasis on soil-based plants.

CHAPTER 3

MATERIALS AND METHODS

3.1 BLOCK DIAGRAM:

The diagram interprets the sensors connected to the aurdino as being mounted on the ground to give the end user the regular status. The status of the day is stored and transmitted through the iot module in the liot cloud. The soil water needs are balanced according to the soil moisture status. By the status of the ph-sensor, alkalinity and soil acidity are rendered neutral. The cell phone will collect day-to-day details. It can be controlled by the user from anywhere.

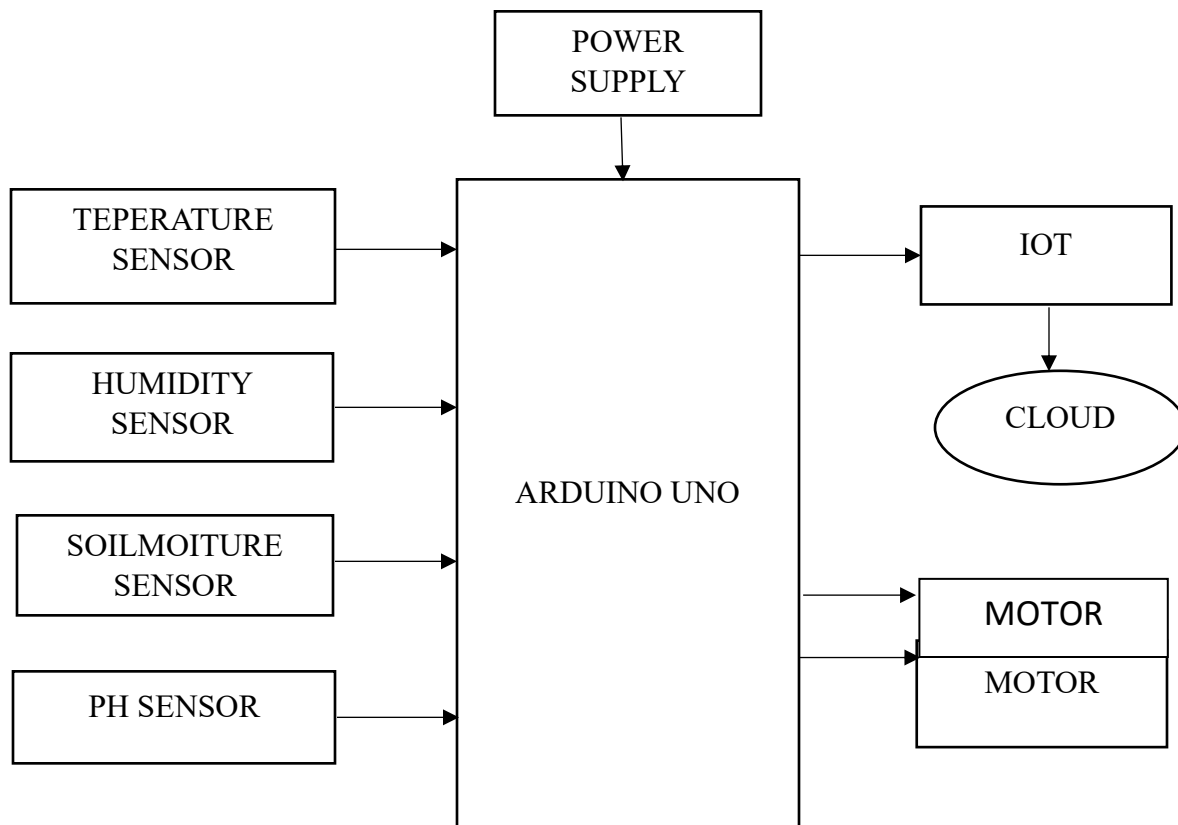


Figure 3.1 BLOCK DIAGRAM OF THE PROJECT

HARDWARE DESCRIPTION

HARDWARE REQUIREMENTS:

- Arduino uno.
- Power supply.
- Soil moisture sensor.
- Humidity sensor.
- Temperature sensor.
- PH sensor.
- GSM module.
- IOT module.
- Dc motor.

3.2 ARDUINO UNO:

Figure 3.2 is the Arduino board that makes electronics as well as coding the best user friendly board to begin on. If you are using this platform for the first time, the UNO is the user friendliest board that you can use to acquire awareness of the electronic platform. The Uno is the most widely used board of the Arduino family as well as the known board.

This board has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analytical inputs, 16Mhz quartz crystal, a USB link, a power jack, an ICSP header and a reset button. Arduino Uno is the ATmega328P based microcontroller. This includes everything necessary to support the microcontroller; only a USB cable pc needs to be connected and powered up with an AC-to-DC adapter or battery in order to be launched.

Arduino Boards, like Arduino Mega, Arduino Leonardo, Arduino Uno, Arduino Due, have been launched on the market in various models. But Arduino Uno and Arduino Mega are most frequent versions. The easiest, simple and most cost-effective alternative will be to use Arduino Uno if you are planning to develop a project on digital electronics, robotics, embedded system or IT.

Figure 3.2 ARDUINO BOARD



3.3 ARDUINO BOARD

It shows in figure 3.3 that there are many Arduino boards in the world where many are versions compatible with third parties. The Arduino Nano V3 and Arduino Uno R3 are the

most official versions available. Both run an Atmel ATmega328P 8-bit 8-bit RAM 16MHz with 32KB flash RAM with 14 inputs and outputs, 6 inputs and outputs of analogues and the 32KB doesn't sound like spinning Windows. Basically Arduino projects can be independent and interact with computer-operated software. Flash, Processing, Max and MSP for instance. The board has a 16MHz ceramic resonator and is powered by a USB connection.

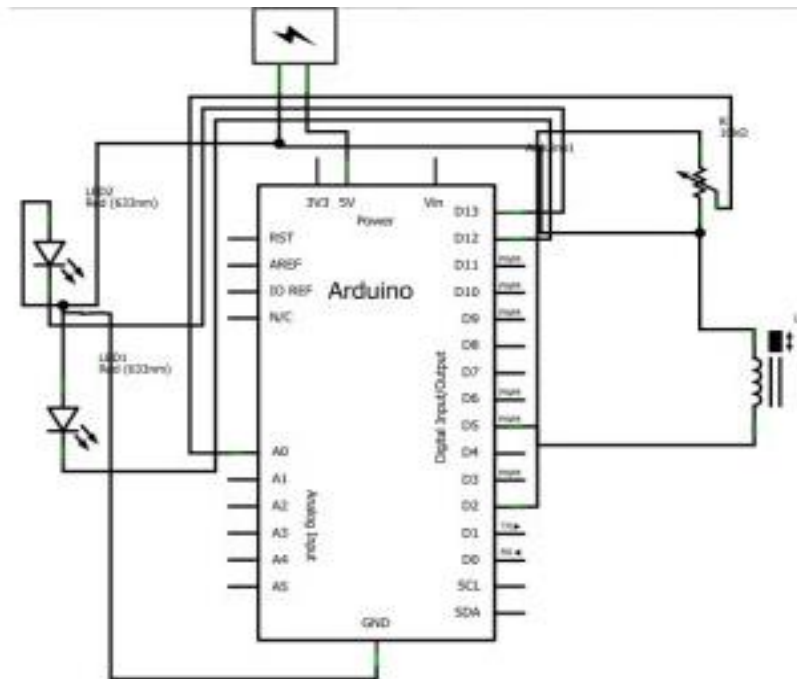


Figure 3.3 ARDUINO UNO WITH DIGITAL INPUTS AND OUT PUTS

3.4 FEATURES OF ARDUINO:

It has a simple USB interface, as shown in figure 3.4. It's a standard unit. The chip on the board enters your USB port and supports the virtual serial port on your PC. The benefit is that serial communication is an incredibly easy protocol which also makes it timeline-

tested and usb-compatible with the modern PC. The ATmega328 Chip can be very easily found in the brain of the microcontroller. It has several features, such as several modes of sleeping, timers, external and interrupts and pins for PWM. The user may then load a new firmware with the Atmel FLIP programmer, or with the DFU programmer, Linux and Mac OS X.



Figure 3.4 PIN DIAGRAM OF ARDUINO UNO

3.5 SOILMOISTURE SENSOR:

The volumetric content of soil humidity sensors is measured in soil water. Because free soil moisture involves extracting, drying and even weighting of the sample in direct gravimetric measures, these sensors indirectly measure the volume content of water using other soil characteristics, such as electrical resistance, neutron interaction, dielectrical constant.

Depending upon environmental factors such as soil type, electrical conductivity, temperature, soil types the soil moisture connection to measured properties must be calibrated and may vary. Rethinked Soil moisture can influence a microwave radiation and is used in agriculture and hydrology for remote sensing. Farmers and gardeners use portable probe devices.

In essence, these sensors refer to the volumetric water content estimating sensors. A different sensor class test other moisture property in soil, known as the water potency sensor, which typically contains gypsum blocks and tensiometers.

Working of Sensor

The soil humidity sensors, as shown in figure 3.5, consist of two tests, primarily used to measure the volumetric content of water. The two samples allow the electricity to pass through the ground and then achieve the resistance value to calculate the humidity values. If too much water exists, the soil leads to a higher current, which means a lower resistance. The humidity is a little high. As there is less water, soil does not conduct a minimum stream that ensures that there would be more resistance. Dry soil conducts no electricity. The humidity level is therefore poor. In two modes, analogue and digital mode, this sensor has been associated. We'll connect the analogue mode first and foremost and use it in the digital mode.

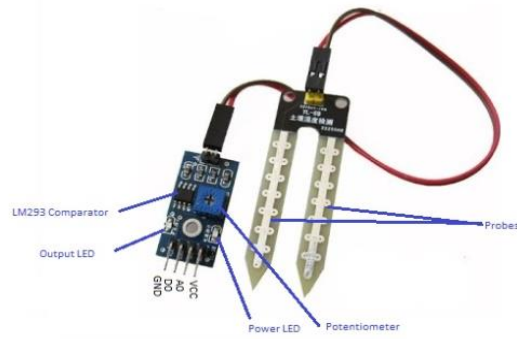


Figure 3.5 MOISTURE SENSOR

Specifications

The specifications of the soil moisture sensor FC-28 are as follows

Input Voltage	3.3 – 5V
Output Voltage	0 – 4.2V
Input Current	35mA
Output Signal	Both Analog and Digital

Pin Out – Soil Moisture Sensor

The soil Moisture sensor FC-28 contains four kinds of pins

VCC is for power

A0 is for analog output

D0 is for Digital output

GND is for Ground

This Module contains a potentiometer which sets the threshold value and then the threshold value is compared by the Im393 comparator. The output LED is light down and up according to the threshold value.

3.6 HUMIDITY SENSOR:

In such areas as process monitoring, environmental management and biomedical research, moisture sensing is extremely important. A microfabricated humidity sensor was developed which utilises a microstructure of nitride or silicone suspended to a minimal distance over the surface of a glass suspension and acts as the moving electrode of a condenser. The suspended structure is covered with a vapour absorbing thin film polymers. Due to the moisture changes, a moisture-dependent micro cantilever bend occurs. There are also changes in the capacity between the micro suspended structure and the substrate.

The humidity sensor is generated from the platinum resistor, which is used to compensate the capacitance signal drift that occurs at temperature as a microtemperature detector. A very high relative humidity has shown lower hysteresis values. The wide area of the microcantilever and the less stiffness in the microcantilever have also achieved a high degree of sensitivity. The calibrated moisture capacity or resistance is recorded and the experimental and simulated samples show high linearity and high stability. In the relative humidity range from 20% r.h. to 40% r.h., the average humidity sensor period is 1.10 Sec.

Digital moisture and temperature sensor are based on the planar power technology that combines moisture and sensor temperature in the sensing components.

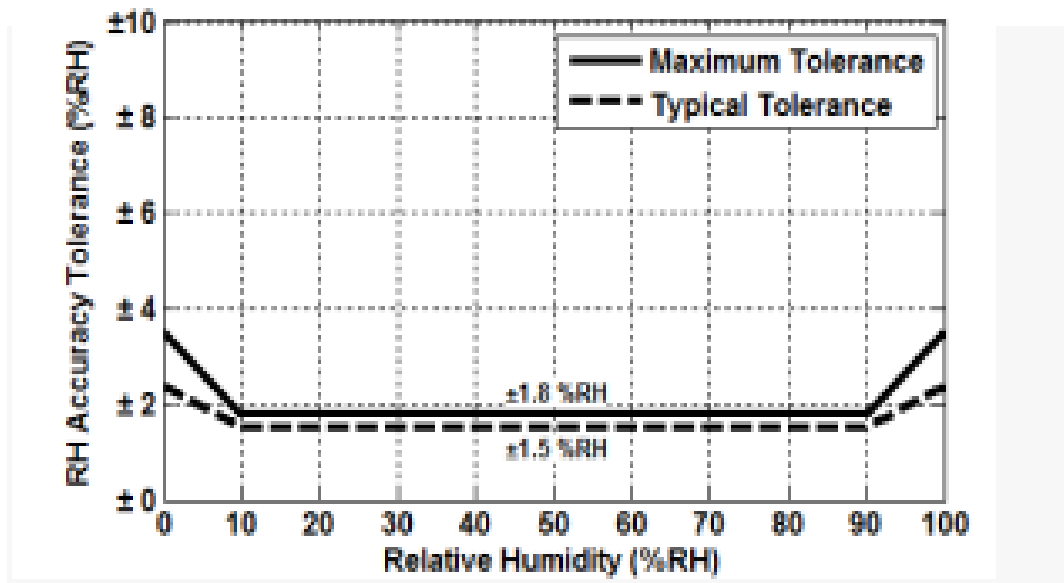


Figure 3.6 TOLERANCE GRAPH

The MVH3201D is the present world's digital sensor of relative humidity and temperature. It is ideal for the most precise applications where sensor efficiency is ideally suited to a variety of environment conditions. Temperature and moisture are one of the essential parameters of the atmosphere, which plays an important role in life and the climate.

APPLICATION OF HUMIDITY SENSOR:

- The humidity sensors has been used in many various applications for measuring humidity in hvac systems ,automobiles , wax machines
- Humidity sensor is also been found as the part of home ventilating , heating, and air conditioning systems . These are also used in industrial spaces , offices, cars, base and greenhouses and museums and are also used in meteorology stations to predict and report weather.

3.7 TEMPERATURE SENSOR:

Figure 3.7 shows the sensor used to monitor and register or signal temperature changes by an electronical system to measure the ambient temperature and transform the input data for electronic data. Many instruments are used to measure the electric signals by the temperature reading. The sensor used is composed of two metals that create electric tension and resistance whenever a slight temperature shift occurs. In industrial applications, temperature is the most common form of physical measurement.

SPECIFICATIONS

Range	0°...100°C
Accuracy	< 0,1°C + NTC-spread over 0°...70°C
Resolution	2 m°C@30°C and 25 m°C@100°C
Linearity	see table
No. Sensors	1....30
Type	5 kOhm NTC-resistors Max. wireresistance 3,3 Ohm
Conditioner	Wheatstone-bridge with +15 Bits ADC
Calibration	at 0°C and 100°C _ 0,1°C
Drift	1 m°C/°C with periodic calibration and 5 m°C/°C without calibration
Scanfreq.	default max. 10 meas./s
Amb.temp	0°...60°
Control	Micro-Wire™ 5 (Di, Do, Clk en CS)
Levels	0 and 5 Volt
Power	+12 Volt 3,5 mAmp (+5,5 +20 Volt) -5 Volt 1 mAmp (-4,5-8 Volt)
Dimensions	224 x 120 x 60 + 40 mm

The fundamental concept of the temperature sensor operation is to place the voltage through the diode terminal. If the voltage increases, it will also increase the temperature and the voltage decreases between the humidor terminal of the transistor and the diode emitter. Encardio Rite includes a sensor that operates on "the theory of tension changes due to changes in temperature." The vibrating wire temperature metre is determined by the premise that the various metals have a different linear expansion factor with changes in temperature.

It consists essentially of a magnet and high tensile stressed cable, which is attached to the two ends to different metals so that, if the temperature changes directly influence the tension of the cable and its natural vibration frequency.

For the Encardio Rite temperature metre, the dissimilar metal is aluminium. The read out unit, used with other vibrating wire sensors, can be used to measure temperatures as the temperature signal converts to frequency. As temperature changes occur the constructed Encardio rite vibrating wire sensor is sensed and transformed into an electrical signal which is then transmitted to the reader as a frequency. This frequency is commensurate with the tempe and the wire tension μ in turn.

$f = 1/2 (\sigma g / \rho) / 2l$ Hz σ is the tension of the wire

g is the acceleration due to gravity

ρ is the density of the wire

l is the length of wire

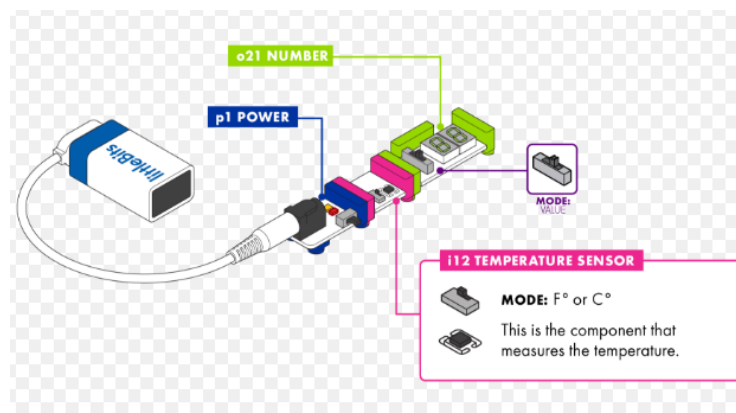


Figure 3.7 TEMPERATURE SENSOR

There are several different types of temperature sensors on the market and they all have different characteristics that depend on the actual applications. There are two basic forms of a temperature sensor:

Types of sensor contact temperature

This temperature sensor must be in physical contact with the sensed entity and used to detect temperature changes for conduction. These sensors may be used for detection on a variety of temperatures of solids, gases or fluids.

Non Contact Temperature Sensor, radiation and convection use this form of temperature sensor to detect temperature changes. These sensors can be used to detect gases, liquids that emit radiant energy when temperature rises and cold drops down in convection currents / detect radiant energy from an infrareded material.

Two basic types of contact / even non-contact temperature sensors can also be segregated into the given following three groups of

- Electro-mechanical

- sensors

- electronic and resistive .

Thermostat

This sensor consists of two different metals such as copper, nickel, aluminium or tungsten that can be coupled together to form a bimetallic strip. Thermostat is a contact electromechanical temperature sensor. The two different metals' different linear expansion rates enable a mechanical bending motion when the band is exposed to heat.

The bimetal strike can also be used to monitor hot water heating elements in boilers, hot water storage tanks, ovens and also in vehicle heating systems. The bimetallic stripe is also used as an electrical switch or as a mechanical way to operate an electrical switch in thermostatical controls.

The Bi-metallic Thermostat

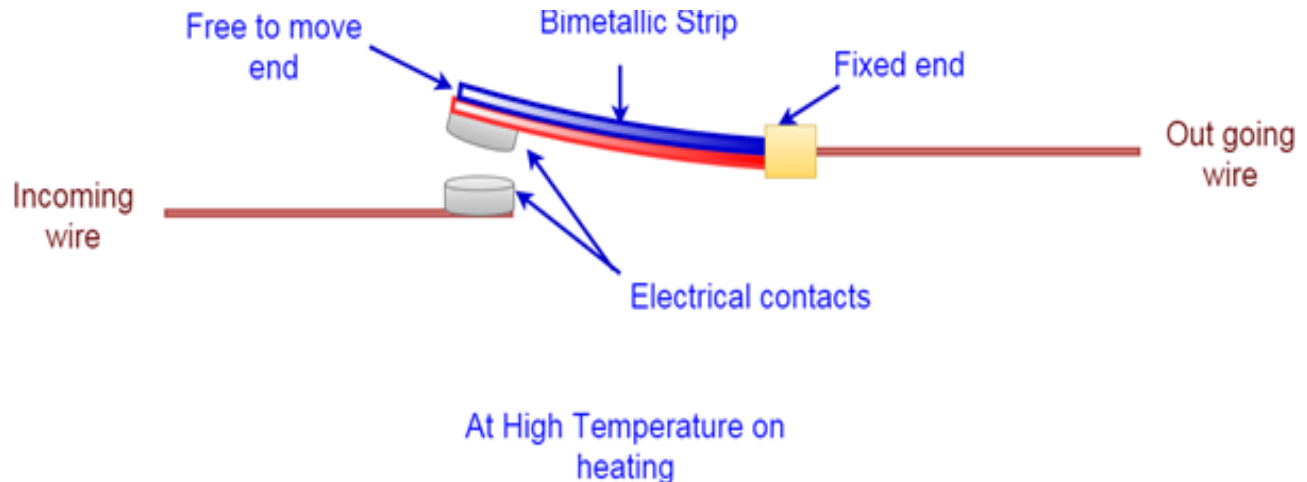


Figure 3.8 BI-METALLIC THERMOSTAT

The thermostat is, as shown in figure 3.8, two thermal metals which are combined back to back. The touch is closed and the current moves through it if it is a cold condition. If the metal is in hot condition, one spreads more than the other and the combined bimetallic strip bends up or down to avoid a flow of electricity.

On or Off Thermostat

Two types of bimetal bands are dependent on movement when subjected to changes in temperature. There is the type of snapaction that spontaneously causes the electrical contacts to move on, off or off at a certain stage of the temperature and the type of slow creeping effect that gradually shifts their location as the temperature changes relatively often.

Snapaction thermostats are essentially used in our house to regulate and track the limiting point of the ovens, immersion hot water tanks, and even to control the domestic heater system on the wall.

Creeper type consists essentially of a bimetal spiral which coils and relaxes slowly if the temperature changes. In general, bimetallic band creeper style strips are more temperature change sensitive than normal ON/OFF types since the band is long and thin making them extremely suitable for gauges and dials etc.

It's very cost-effective and is usable over a wide range of operations - one of the key disadvantages of the traditional snap-action style thermostat when used as a temperature sensor - which range from when electrical contact open to closing again. For instance, it can be set to 20°C but not open until 22°C or not close again before 18°C.

The temperature range can be very wide. A temperature control screw is used to reset the available bimetallic thermostat for use in the home to provide an accurate temperature and hysteresis setup.

3.8 PH SENSOR

pH is a measured acidity and alkalinity or caustic and basic found in a particular solution, generally used for water measurements. It is usually given a numerical scale of 0-14. Neutrality is a value of 7. With increasing alkalinity the numbers on the scale increase, while numbers on the scale decrease with the acidity. The tenfold changes in acidism or alkalinity occur in each unit of transition. The pH value is equivalent to the hydrogen-ion concentration or hydrogen-ion activity negative logarithm. The table to the right lists pH values for some common solutions.

Combination pH Sensors

Usage of an electrochemical pH sensor is the traditional method used to measure the pH of the soil. One type of electrochemical pH sensor, which houses both the electrode and the reference electrode, is a pH combining sensor. The measurement electrode detects variations in pH where a stable signal for comparison is given as a reference. In order to show the millivolt signal on the unit pH, this high impedance unit is known as a pH

metre. In the construction of various product types pH sensors and industry and process pH sensors can be used combination technology.

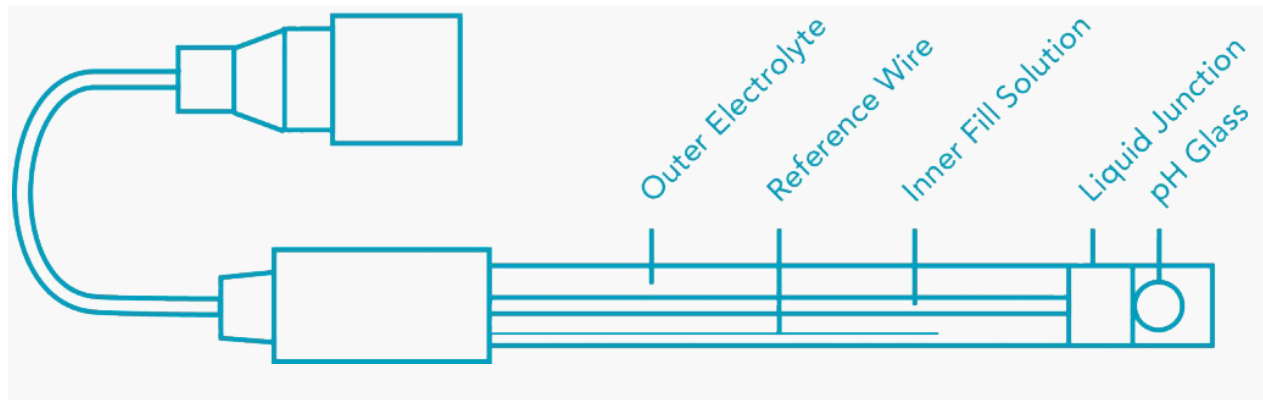


Figure 3.9 PH SENSOR

Common Applications:

- ph nutralization of effluent in industrial and domestic manufacturing environments
- Environmental monitoring
- Cooling tower and boiler control
- Food and beverage quality control and safety
- Odor scrubbers
- Upstream protection of filtration membranes
- Pulp and paper manufacturing
- Water pre-treatment for manufacturing processes
- Swimming pool control
- Blood-gas analysis in medical devices
- Pharmaceutical research & development and manufacturing

OPERATION

Principle of operation

The potentialometric pH metre is used in the voltage measurement between two electrodes to show the result that has been converted to pH. It consists of a basic electronic amplifier and two electrodes, i.e. a combination electrode and a dispersion tuned into pH units. The glass electrode normally is the same as one reference electrode or an electrode mixture. The electrodes/samples are put in the solution to be examined.

The key element is the design of the electrode. These are rod-like structures that are essentially made of glass, with the bulb in the bottom. A pH measurement electrode is made of glass that is specifically designed to be targeted to the concentration of hydrogen-ion. When the hydron ions present on the tested solution have to be placed on the glass bulb, which is supposed to be replaced with other positively chargeable ions, generating an electrical potential in the bulb. It recognises the difference in electrode potential in the two measured electrodes and converts the potential difference to pH units. The electronic amplifier is present in it. In linear connection with the pH of the Nernst Equation, the extent of electrochemical potential throughout the glass ampulum.

The reference electrode, which is made of a metal conductor connected to the monitor, is very insensitive to the pH of a given solution. This leader is put in the potassium chloride electrolyte solution, which comes into contact with the test solution via a porous ceramic membrane. The monitor includes a voltmeter that displays the tension in pH units.

A new electronic circuit, which generates and detects the potential difference by the voltmeter, is completed when you place the glass electrodes and the reference element in the test solution. It may be thought that the system extends between the conductive component of the reference electrode and the potassium chloride solution, the ceramic membrane, the test solution and the glass electrode hydrogen-ion selecting glass, and the solution within the glass electrode, to the electrode silver and finally the display device voltmeter. This voltage varies from one test solution to another

since the potential difference between the test solution and the other solution within the glass electrode is due to the difference in the hydrogen ion concentration on either side of the glass membrane which. All other possible variations in the circuit do not change with pH and are calibrated for.

Many pH metres otherwise use the glass electrode combination sample and the reference electrode that is housed in a single sensor. The article on glass electrodes provides a comprehensive overview of the combination electrodes.

The pH metre is manufactured with the standard pH solutions prior to each usage to ensure accuracy. In order to measure the pH of the solution provided, the electrodes are sampled and placed on the test solutions for long periods enough to balance the hydrogen ions with the ions on the surface of the bulb on the glass electrode for the test solution. The balance ensures a consistent pH calculation.

3.9 IOT MODULE (ESP8266)

The arduino module ESP8266 is a low-cost Wi-Fi chip with complete TCP or IP capability, and one thing is stunning is the integrated MCU that provides an interface through which to manipulate digital I/O pins through simple near-pseudo-coding, like a language programming. Espressif Systems manufactures this kit.

This chip was viewed in August 2014 by AI Thinker, a third-party manufacturer, in the ESP-01 version module. This module allows the MCU to connect to the Wi-Fi Network and helps to build easy TCP or IP connections. It is a very affordable module, which attracted many makers and hackers in a variety of projects. As a true success, Espressif now manufactures several models with various dimensions and technical requirements. ESP32 is one of the predecessors.

one can find over hundreds of projects in the internet and various implementations like data logging solutions, home automation, controlling things over the internet, robotics, even drones.

ESP8266-01 TECHNICAL SPECIFICATIONS:

- 32-bit RISC CPU: Tensilica Xtensa LX106 running at 80 MHz **
- 64 KB of instruction RAM, 96 KiB of data RAM
- External QSPI flash – 512 KiB to 4 MiB* (up to 16 MiB is supported)
- IEEE 802.11 b/g/n Wi-Fi
- Integrated TR switch, balun, LNA, power amplifier and matching network
- WEP or WPA/WPA2 authentication, or open networks
- 16 GPIO pins **
- SPI, I²C,
- I²S interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
- 1 10-bit ADC

3.10 GSM:

GSM is the mobile network which means mobile phones can link to it in the immediate vicinity, by finding the cell. In the GSM network, there are five entirely different cell sizes – macro, microcell, pico, femtocell and umbrella cells. The space of the cell coverage can vary according to the context. Macro cells would be considered as cells everywhere since the antenna of the base station is placed on a higher building than the typical rock top. Small cells have a lower height of the antenna and are used essentially in urban areas. Cells with a covering diameter of few metres are terribly small; they are normally used indoors. GSM Associate Degree Indoor Coverage is provided by a combination of the indoor base station picocell and an indoor repeater with the distributed indoor antenna feeder via power splitters to present radio signals from the outdoor

antenna into the separate indoor antenna system distributed. These are primarily used when decision-making capacity is needed indoors, for former centres and airports.

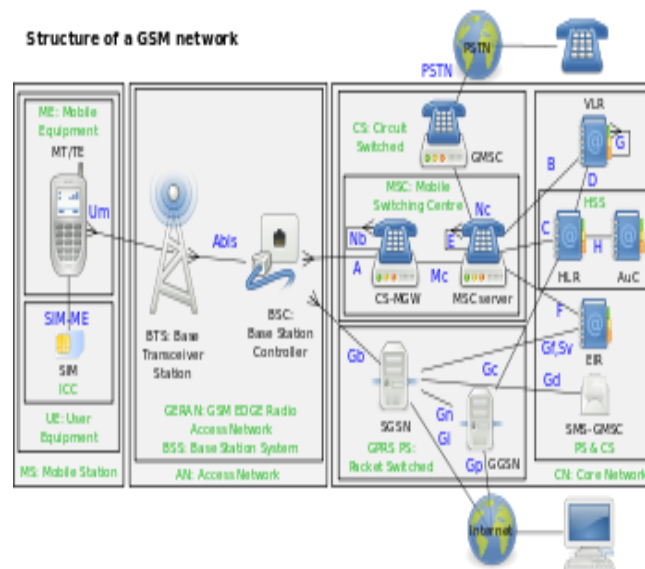


Figure 3.10 GSM NETWORK

The GSM system for communication purposes is developed as a digital systematic with TDMA technology. A GSM digitises and decreases data and sends it through a two-stream channel, each with its own allocated time slot. The digital system is capable of carrying 64 kbps of data rates to 20 Mbps.

GSM ARCHITECTURE:

A mobile station as shown in figure 3.11: This cell phone is made up of the receiver, the monitor and the processor and operated by a network-based SIM card. Base Station Subsystem: It serves as an interface between the network subsystem and the mobile station. The base transceiver station includes the radio transceivers and manages mobile communication protocols. It is also comprised of an interface from the mobile and the mobile switching centres which control the Base Transceiver

station. Subsystem Network: it offers the basic cell network link. The core component of the network subsystem is an MSC providing links to various network sites such as ISDN, PSTN and so on. It also comprises the Home Location Record and the GSM Calling and Roaming Capabilities Visitor Location Record. The Equipment Identity Register also holds a record of all mobile equipment, in which every mobile phone has its own IMEI number. International Mobile Equipment Identity stands for IMEI.

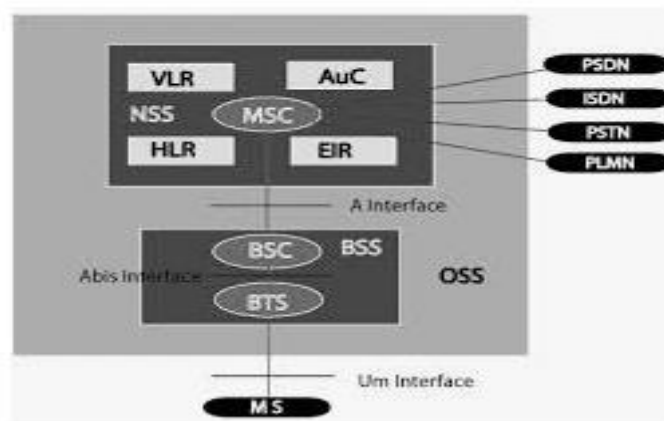


Figure 3.11 GSM ARCHITECTURE

TECHNICAL DETAILS :

The GSM network can be divided into three broad parts

- The subscriber will carry the mobile station
- Base station subsystem will control the radio link to the mobile station
- Network subsystem handles the switching of calls
- The mobile users and other mobile and fixed network users

FUTURES OF GSM

GSM is part of wireless mobile telecommunications, along with other technologies including very high-speed, circuit-based switched information, general radio packet systems, the improved Data GSM environment and the universal mobile telecom system.

3.11 DC MOTOR:

A DC engine is one of the major rotating devices for converting electrical energy from direct current to mechanical energy. The most popular form depends on the magnetic field strength. Close to any kind of DC engine it may be electromechanical or electronic to changing the current flow path periodically in one part of the engine to some kind of internal mechanism.

DC motors are the first type to be commonly used because they can be operated from the existing power distribution system for direct electricity lighting. A variable supply voltage or a change of currents power in field windings may also be used to operate a speed channel DC motors across the broad range. In tools, toys, and appliances, small DC engines are used. It is also a lightweight brushed motor which can be powered by direct current, but it is only for portable power tools and appliances. In propulsion, hoists, elevators or roller mills for stealing, Large DC engines were used. DC motors have been replaced with AC motors in many applications through the advent of power electronics.

WORKING:

The DC engine is the electric energy transforming machine in a rotation in the form of mechanical energy. Its moment is created by electromagnetism's physical behaviour. The DC motors are inductors inside which the magnetic field used for the movement is generated. However, if the DC current is used the magnetic field will shift.

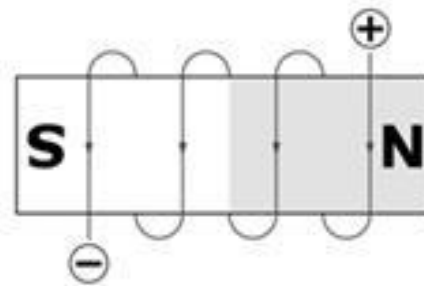


Figure 3.12 ELECTROMAGNET

This may be a piece of iron wallpaped with a wire coil which has tension applied at its terminals, as shown in Figure 3.12. If there are 2 fixed magnets on either side of this magnet, as shown in figure 2.13, then the torsion can be generated by repulsive, engaging forces.

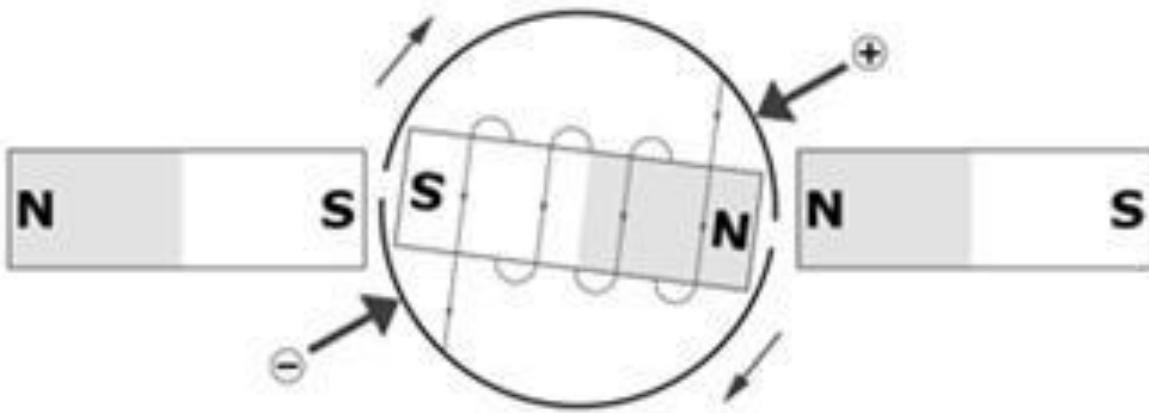


Figure 3.13 TWO FIXED MAGNETS ARE ADDED TO THE ELECTROMAGNET

There are also 2 problems to resolve: to supply the present spinning magnet without twisting the wires, and to resolve any problem dynamically with two devices at the right time, namely a scattering ring switch and 2 pins.

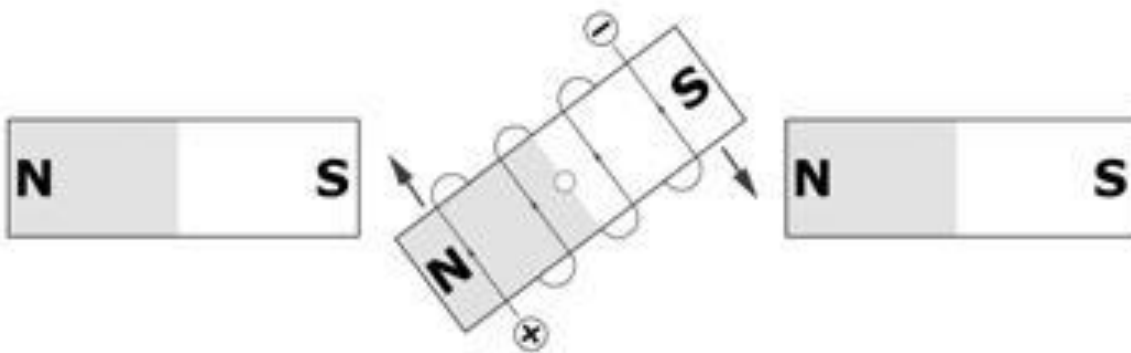


Figure 3.14 ROTATING ELECTROMAGNET

As shown in figure 3.14, the switch is made up of two segments which are connected to each electromagnetic device terminal; the brushes which help to apply electricity to rotary electromagnet are independent of the two arrows. It is built into 3 slots instead of 2 and 2 brushes in actual DC motors.

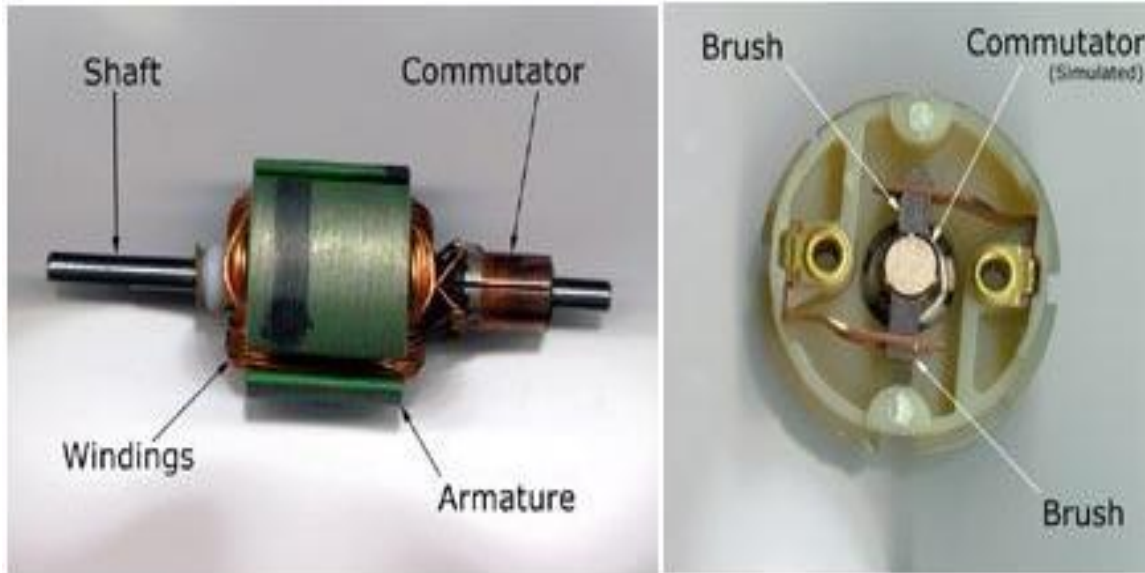


Figure 3.15 DC MOTOR

As the electromagnet films the polarity continues to change and the shaft can continue to rotate. While it is simple, and sounds fantastic but there are few problems, which do not make the motors mechanically stable and inefficient, the key problem lies in the timing of each polarity inversion. Where polarity changes mechanically in an electromagnet at few speeds polarity very early changes that can lead to reverse impulses and, often, spontaneous turn-out. It causes mechanical instability, whatever the case may be.

CONTROL OF DC MOTOR:

The DC engine has only two connections, as shown in Figure 3.16. The engine is able to operate if the voltage is applied to the terminals. When the terminal is changed, the engine changes direction while the motor runs and shuts down abruptly. All terminals. Per terminal. The engine will however continue to spin quickly until it stops. If the motor works and you abruptly stop the engine when it is short on both terminals. Thus, no third cable is used to power a DC motor, so we also consider how to control it. The H-Bridge Care Assistant is also the solution.

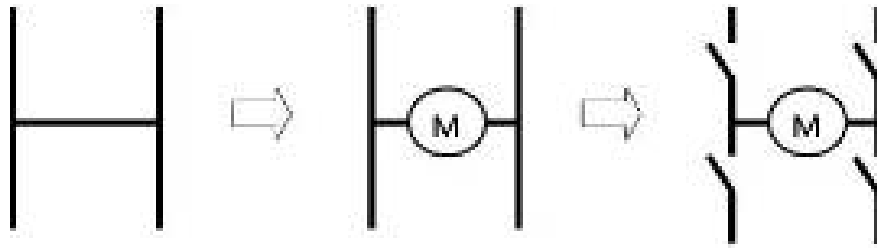


Figure3.16 WORKING OF DC MOTOR

If you look at the latest DC motor development above, you will find that there are four doors and a motor connected between them. This is the simplest H-bridge, where the four gates are transistors. By operating the door and connecting the upper and lower terminals to a voltage source, the motor can be controlled in all modes as shown below.

Main Types of DC Motors

Understanding the various DC motor types can also allow you to understand the use and form of DC motors used for different applications.

There are 4 main types of DC motors:

1. Permanent Magnet DC Motors

In order to generate the field flow, the permanent magnet motor uses a permanent magnet. This form of DC motor has a high starting torque and very good speed control, the torque is limited, so it can be found basically on a low power.

2. Series DC Motors

The field is wound in a DC series with a couple of turns of a long wire that carries the entire frame current. Series DC engines usually produce large starting torque but cannot speed control and can be damaged without load. These limitations mean that variable speed drive applications are not a good choice.

3. Shunt DC Motors

The field is associated with armature windings in the Shunt DC engines in parallel (shunt). The shunt fields can be excited separately from the rear windings, which also have simpler reverse controls, and provide high-speed regulation.

4. Compound DC Motors

Compound DC motor have a separately aroused shunt area, as have shunt DC motor. Compound DC motor have strong starting torque, but control problems can occur in applications for variable speed drives.

SOFTWARE DESCRIPTION

- Arduino IDE.
- PHP

3.12 ARDUINO IDE:

As shown in Figure 3.17, the Arduino IDE is very basic, but for most Arduino projects it offers an almost complete setting. The top menu bar contains standard options including file (new, save, archive, etc.), editing (source, copy, paste, etc.), skizze, sketch and "instrument." (Useful test item options) and assistance. At its heart, you can insert software codes in a simple text editor. The bottom of the IDE is used for the output window used to view compilation stats, such as how much memory was used, if any bugs in the source code and many other useful messages are found.



Figure 3.17 ARDUINO WINDOW

Sketches are named projects provided by Arduino. These sketches are normally written in a C++ version simplified (not having C++ features). Since programming for microcontrollers is not computer-based, they vary from device libraries (for example, changing the output mode, outputting data to pins, reading analogue values and timers). Often this confuses users who believe Arduino is programmed in 'Arduino.' Arduino is designed for C++, however. Use device-specific libraries only.

The 6 Buttons

While many more advanced projects will take the advantage of the built in tools present in the IDE, all the projects will depend on the six buttons found below in the menu bar.



Figure 3.18 BUTTON BAR

The button bars

As shown in the figure 3.18

You can verify the code with the check mark. Click here after the code has been completed or the code has been written. Arrow is going to upload the code for execution to Arduino. A new file is made by the paper pointed out. To open up the current Arduino project, the up arrow is used. Using the down arrow, the current file is saved. The button on the far right is the serial monitor that is useful for debugging data from the Arduino to the PC.



Figure 3.19 SOURCE CODE WINDOW

As shown in Figure 3.19, the GNU General Public License version 2 contains the sourcecode for the IDE. The Arduino IDE has special rules to structure the code with the C and C ++ languages. This project offers many traditional procedures for check-in and check-out.

The code that is written by the user requires two main features, to perform the sketch and loop for the main programme, to compile it and link it to the main() programme stub, which can use the GNU tool chain contained within the performed IDE. distribution. distribution. The Arduino IDE uses the avrdude software to convert executable code in a hexadecimal encoding text format, which is loaded by a loader to the Arduino board in the firmware of the board.

Sketches are named projects provided by Arduino. These sketches are normally written in a C++ version simplified (not having C++ features). As the programming of microcontrollers is different from that of machine, there are several options: libraries for particular devices (such as changing the output mode, outputting data to pins, reading analogue values and timers). Often that confuses users who believe that Arduino is programmed in the language of "Arduino."

Arduino is designed for C++, however. Using only device-specific libraries. Using basic code structure rules Arduino IDE supports C and C++ languages. A software library from the wiring project, providing several popular input and output routines, is provided with the Arduino IDE. The user-written code only requires the sketch and the main programme loop to perform two main functions. These functions are compiled and connected to the main() in the GNU loop executor, also included in the distribution programme IDE.. The functions are compiled. The Arduino IDE converts the executable code in a hexadecimally coded text file using the avrdude software and then loads it into the Arduino card using the motherboard firmware bootloader programme.

3.13 EMBEDDED C:

Embedded C is a programming language hottestll liked|preferred|most favourite} for electronic gadget creation. The embedded software is connected to any processor employed in the electronic system. Incorporated C programming is a crucial part of the processor's performance. We use many electronic devices in our everyday lives similar to cell phones, washing machines, digital camera etc. The functionality of this system is based on an embedded C microcontroller.

C code is favoured over other languages in embedded machine programming. Because of these reasons:

- o Easy to comprehend

- o High confidence

- o Transferrability

- O Scaffolding

A function is a set of statements for a particular purpose and the programming language is a collection of one or more functions. The programme that provides functions on a device is known to many customers. Incorporated software, however, is normally less convincing. Unlike software for applications, firmware has set hardware specifications and features and regulates strictly the inclusion of any hardware or software from third parties.

The appropriate system controllers at the time of production must be in the firmware and device drivers for specific hardware should be written. The programme depends very heavily on the processor and the microcircuit selected. At least some experience of reading circuits is available to most embedded software developers. To evaluate the usage of registers and communication systems, read the part table. It is just like bit manipulation to convert between decimal, hexadecimal, and binary numbers. Web applications are seldom used, and there are usually no computer file systems and databases for XML files or other results.

In software development, a cross-compiler that runs on a machine and generates execution code for the target device is needed. Debugging involves an emulator, JTAG

or SWD in-circuit system. Software developers generally have access to the full source code of the kernel (OS). There can be large variations in the storage devices and RAM. Some systems run 16 KB of flash memory and 4 KB of ram with 8 MHz processors, whereas other systems can run on modern computers. Such room needs to be supplemented. Not in C++ in C or embedded C++. Interpreted languages, including BASIC (and BASIC-compiled E.Parallax Propellers) and Java (Java ME Embedded 8.3 for earlier e.ARM microphones in Raspberry Pi and Intel Galileo, Cortex-M7 and ARM11). It is possible to use the controller gene. 2) The MicroPython language interpreted by Python 3 for use on microcontrollers, 32-bit ARM-based microcontrollers (such as the BBC: micro:bit) and 16-bit pics are used for explicit implementation; but not for universe use. It is important to communicate between processors and between processors and other components. Popular protocols include I2C, SPI, serial interface, USB as well as direct memory addressing. Specifically for embedded systems communication protocols are available as a closed source from companies such as InterNiche. The technology and CMX system open source protocol come from uIP, lwip and some keywords:bit

- sbit
- sfr
- small
- large

CHAPTER 4

RESULTS , CONCLUSION AND FUTURE SCOPE

The project consists typically of a central arduino one with other pieces. This iot module serves as a hub for connecting various types of sensors including moisture sensors and humidity sensors. Sensors are attached to their location and the sensors forward data to the iot module consisting of an integrated wireless Internet connection technology. On the Internet there is a cloud where sensor values are changed every second in real time. The user can check the parameters anywhere.

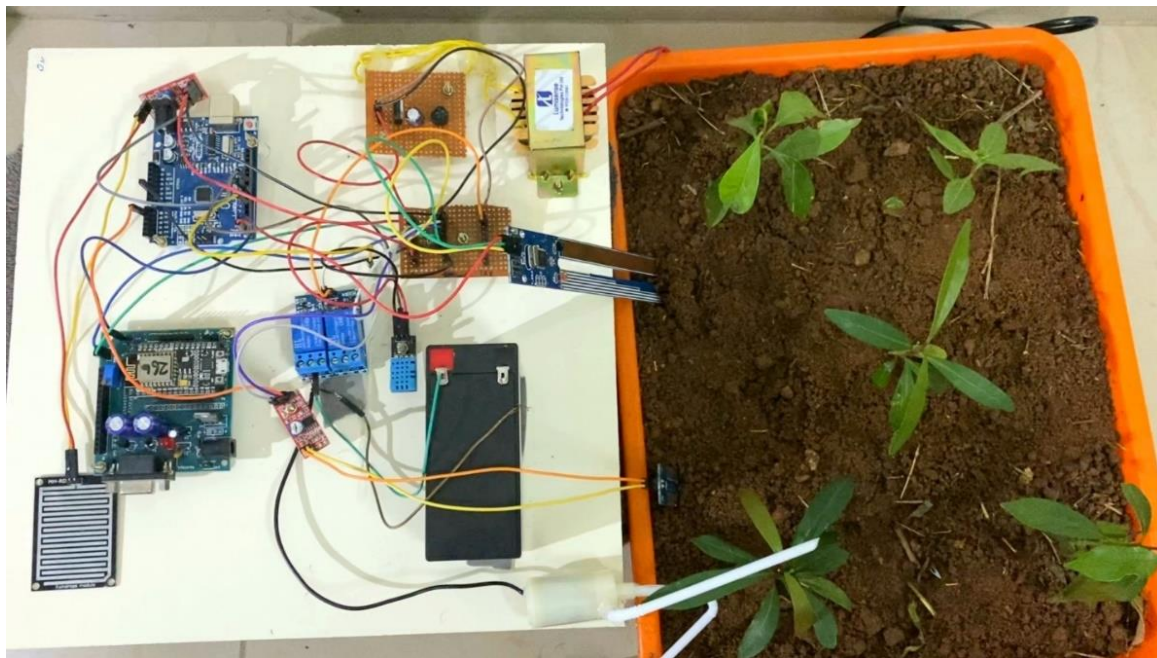


Figure 4.1 FINAL APPEARANCE OF THE PROJECT

CODE WHICH IS COMPILED AND EXECUTED

The project was carried out with Arduino IDE's latest edition. The code in the source code window has successfully been searched and run, only when the Arduino board has been linked to the laptop can be executed.



```
ph_monitor | Arduino 1.8.13
File Edit Sketch Tools Help

#include <dht.h>
dht DHT;
#define DHT11_PIN 8
#define soil A1
#define motor1 6
#define motor2 7
void setup()
{
    Serial.begin(9600);
    pinMode(soil,INPUT);
    pinMode(motor1,OUTPUT);
    pinMode(motor2,OUTPUT);
}
void loop() {
    int chk = DHT.read11(DHT11_PIN);

Done compiling.

Sketch uses 7030 bytes (21%) of program storage space. Maximum is 32256 bytes.
Global variables use 283 bytes (13%) of dynamic memory, leaving 1765 bytes for local variables. Maximum
```

Figure 4.2 SOURCE CODE

DIALY STATUS SHOWED IN THE MOBILE

Daily status is shown in the below figure 4.3. This information can be checked by the end user in his or her mobile with the given link from any location

LogID	↑ ↓	DATA	↑ ↓	Logdate	↑ ↓	LogTime	↑ ↓
4		Temperature_ =_34.00Humidity_ =_60.00		02/26/2021		17:05:14	
9		A=		02/26/2021		17:06:16	
10		PH_Value8.00		02/26/2021		17:06:28	
12		Moisture_Percentage_ =_0.00		02/26/2021		17:07:20	
19		PH_Value37.65		02/26/2021		17:09:11	
29		Moisture_percentage_ =_42.00		02/27/2021		14:46:15	
37		UY[		02/27/2021		14:48:03	
85		A=		02/28/2021		12:36:21	

Figure 4.3 DAILY STATUS

4.1 CONCLUSION

Project reflects the IOT kit. It is fitted with certain sensors including moisture, temperature, humidity and PH. In this package the quality of the soil is provided to the end user through the GSM module, where the data is regularly displayed. This package offers mobile telephone applications for information to end users. This project is beneficial and the farmers and children can easily handle the system. The system is implemented with additional "sensors," such as "temperature" and soil-humidity sensors. The system includes the dc motors to adjust the ground humidity and Ph in the ground. The Wi-Fi is a remote control for electronic devices.

4.2 FUTURE SCOPE

In this report, the issue of conventional gardening systems has been tackled. The data are captured and transmitted to a central cloud server via the temperature, moisture, and ph sensors. In addition, users receive all information about the garden and can also use their mobile devices to communicate with it. With the addition of new sensors and valves, the established device can also move in the field fertilisers and the other agricultural chemicals (calcium, sodium, ammonium, zinc). The device can be used for both commercial and agricultural gardening purposes. The improvement of our project is possible by adding a webcaper that can forecast the plants' water and weather. If the plants are predicted to have less water. In order to estimate water used for irrigation and therefore to estimate the cost, a water metre can be built. To change the water flow rate, a solenoid valve may be used. In addition, wireless sensors can be used as well.

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SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT

by Karambiam Sreekanth Sreekar Vaka Venkata Bhargava Reddy

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SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT

Submitted ²³ in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in
Electronics and communication Engineering

by

KARAMBIAM SREEKANTH SREEKAR (Register No. 37130186)

VAKA VENKATA BHARGAVA REDDY (Register No. 37130423)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING**

¹⁵
**SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
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APRIL 2021

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **KARAMBIAM SREEKANTH SREEKAR** (Reg. No. 37130186) and **VAKA VENKATA BHARGAVA REDDY** (Reg. No. 37130423) who carried out the project entitled "**SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT** " under our supervision from December 2020 to April 2021.

Dr.P. GRACE KANMANI PRINCE

Internal Guide

Dr. RAVI

24

Head of the Department

Submitted for Viva voce Examination held on _____

Name:

Signature:

Internal Examiner

External Examiner

DECLARATION

We **KARAMBIAM SREEKANTH SREEKAR** (Reg. No. 37130186) and **VAKA VENKATA BHARGAVA REDDY** (Reg. No. 37130423) hereby declare that the Project Report entitled “**SMART CONTROL OF SOIL QUALITY FOR GARDEN USING IOT**” done by us under the guidance of **DR.P. GRACE KANMANI PRINCE** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and communication Engineering.

1.

2.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATES

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ABSTRACT

The project deals all with the method of monitoring the soil, from the manual to the smart or dynamic irrigation process. This results in greater convenience, efficient water use and less human monitoring effort. This project provides a cloud-based Internet of Things infrastructure and Arduino Uno control system. The watering requirement can be modified in this method for a soil by controlling the soil humidity. The measurement of plant ground moisture provides knowledge whether the plant is watered, watered or underwatered preferably. A plant ph measurement gives information on the soil's alkaline or acidic weather, depending on the mineral value provided to the soil. The proposed device tracks the soil moisture, moisture, temperature and ph. All data are tracked and monitored continuously via GSM into the IoT cloud. In the cloud, the data from the device is analysed and an action is sent accordingly from the cloud when a target level for soil moisture and PH is reached. In order to implement the system control unit, an arduino uno microcontroller is used. IoT is used to maintain the status of the garden owner updated. Sensor information is constantly updated on an IoT cloud and the end user is still able to verify the status. The sensor readings can be checked from any mobile or PC connected to the connection provided.

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CHAPTER 1

INTRODUCTION

Now in today's world, people are still really linked to the internet during their job execution. In the last few years, much more technology has taken hold and developed to monitor the quality of soil in the field of gardening. Certain IOT devices have been developed which are used in soil, which automatically gives the soil water and improves crops based on its colour and appearance. The key motor of the project is to tell the end user who operates the device about soil quality. The current IOT system is also run on sensors of the weather where all sensor readings are observed. The soil, air moisture and temperature, ph and water pumps are all moisturising with the weather sensors used. This project provides many benefits for users who are very interested in plant development. This research is mainly motivated by the use of IOT hardware components to build an IOT-enabled collection. The problem statement for the project is to incorporate a soil information kit that observes the day-to-day soil monitoring. In the future, the collected information can be more used. Monitored soil information or soil status may be monitored through a smartphone or personal computer.

1.1 AIM OF THE PROJECT

This project aims mainly at improving the agricultural output and reducing labour efforts, which have led to significant innovations in the human history. Nonetheless, in all these import times the high population rate has never allowed demand and supply to balance.

This project is why smart soil quality control is introduced for gardening using iot. The temperature, humidity, soil humidity, pH value of the soils using sensors can be continuously monitored in this process depending on these values, water flow can also be regulated through IOT and the pH of the soil. This means that water is used efficiently and the production is increased with less human effort.

1.2 EXISTING SYSTEM:

- In this existing system, they have only calculated the soil moisture value and humidity values.
- In the existing models if the moisture of the soil is reduced then the alert will be generated so the user will switch on the water supply.
- The system will be restricted to the particular area so the user will need to be available to check the system performance.

1.3 PROPOSED SYSTEM:

- In the proposed system, we are calculating the soil PH value and rain condition.
- The system operation will be monitored cloud so we can check the values like moisture, PH value from anywhere.
- An automatic system is established so whenever the soil is in dry state the motor will automatically ON.
- The user will not need to monitor the garden every time by his own, he can check the values from anywhere using cloud.

CHAPTER 2

LITERATURE SURVEY

In the contact with the controller, ⁷ Angel C and Asha S[1] focused on reducing energy consumption by the sensors. For the study, the sensors such as Soil ph Sensor, Moisture Sensor Sensor and so on were used. Based on the data sensed and taken, the device decides on the appropriate irrigation action and also calls on the end user.

This solution would boost the garden that is truly beneficial to the modern world with water that has become a significant resource in recent years. In the system they suggested[2], Baltej Kaur, Danish Inamdar, essentially employed an android mobile application to monitor the system automatically. In order to track the soil condition, the different sensors such as humidity, temperature and soil are positioned on the ground. The information collected by the sensors is transferred to the mobile app using the controller based on soil conditions. User functions like irrigation controls, space views, personalised diagrams, ⁷ real-time data access, remote access warnings and plant models can help build an intelligent user-friendly system.

Karan Kansara¹, Vishal Zaveri¹[3] use the key approach in their research: to save the end-user both time and money and power. Automatic control instead of manual was used in conventional gardening techniques. Work efforts can be minimised by automated irrigation control. Whenever the temperature shift is dramatic, the humidity in the environment senses a change in temperature, moisture and gives the microcontroller some signal. The drip can be automatically and manually operated.

SIZINI E. A. Saifullah, S. Han and M. Gidlund U.Jennehag SIZINI E. The research on the Internet of Things plays a major role in Internet connectivity and turning ordinary objects into smart devices A. Saifullah, S. Han, U.Jennehag, and M. Gidlund[4]. The latest IoT changed the interaction between people and their surroundings. These advantages not only serve consumers but also industrial purposes very appealing. In recent years, the

IoT model has played a significant role in the industry marketplace with deliberately constructed solutions.

The author's approach is: agriculture plays a key role in RN Rao, B Sridhar[5]

The agriculture was always the key to the country's growth. Smart farming by modernising conventional methods of farming is the only solution to this issue. The proposed method is therefore intended to make agriculture smart with automation and IoT. Things' Internet (IoT) enables different applications to track and pick crop growth and support irrigation decisions.

In the current situation, growing organic home-grown ¹⁹plants for health and safety is becoming increasingly essential for many people, writes author P Jariyayothin, K Jeravong [6]. But others have no ¹⁹time to care for the plants. The IoT Backyard system for monitoring and control of watering of domestic plants is therefore introduced in this project. We use the Internet of things (IoT) and inexpensive technology with a water tank with tap and emphasis on soil-based plants.

CHAPTER 3

MATERIALS AND METHODS

3.1 BLOCK DIAGRAM:

The diagram interprets the sensors connected to the aurdino as being mounted on the ground to give the end user the regular status. The status of the day is stored and transmitted through the iot module in the liot cloud. The soil water needs are balanced according to the soil moisture status. By the status of the ph-sensor, alkalinity and soil acidity are rendered neutral. The cell phone will collect day-to-day details. It can be controlled by the user from anywhere.

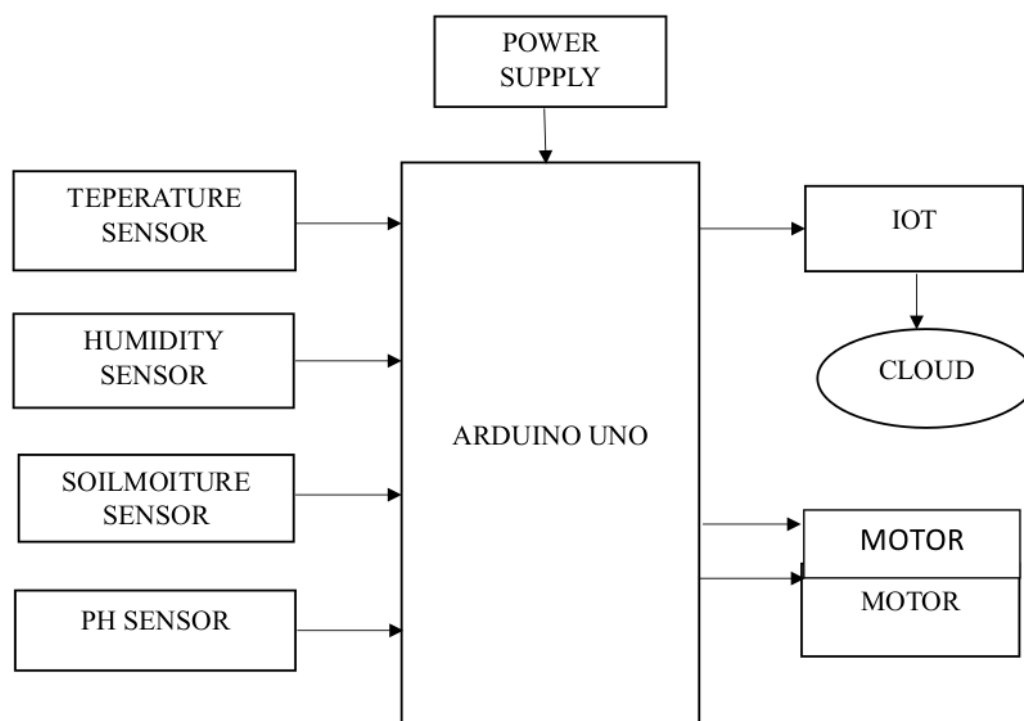


Figure 3.1 BLOCK DIAGRAM OF THE PROJECT

HARDWARE DESCRIPTION

HARDWARE REQUIREMENTS:

- Arduino uno.
- Power supply.
- Soil moisture sensor.
- Humidity sensor.
- Temperature sensor.
- PH sensor.
- GSM module.
- IOT module.
- Dc motor.

3.2 ARDUINO UNO:

Figure 3.2 is the Arduino board that makes electronics as well as coding the best user friendly board to begin on. If you are using this platform for the first time, the UNO is the user friendliest board that you can use to acquire awareness of the electronic platform. The Uno is the most widely used board of the Arduino family as well as the known board.

This board ⁵ has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 digital inputs, 16MHz quartz crystal, a USB link, a power jack, an ICSP header and a reset button. Arduino Uno is the ATmega328P based microcontroller. This includes everything necessary to support the microcontroller; only a USB cable pc needs to be connected and powered up with an AC-to-DC adapter or battery in order to be launched.

Arduino Boards, like Arduino Mega, Arduino Leonardo, Arduino Uno, Arduino Due, have been launched on the market in various models. But Arduino Uno and Arduino Mega are most frequent versions. The easiest, simple and most cost-effective alternative will be to use Arduino Uno if you are planning to develop a project on digital electronics, robotics, embedded system or IT.



Figure 3.2 ARDUINO BOARD

3.3 ARDUINO BOARD

It shows in figure 3.3 that there are many Arduino boards in the world where many are versions compatible with third parties. The Arduino Nano V3 and Arduino Uno R3 are the most official versions available. Both run an Atmel ATmega328P 8-bit 8-bit RAM 16MHz with 32KB flash RAM with 14 inputs and outputs, 6 inputs and outputs of analogues and the 32KB doesn't sound like spinning Windows. Basically Arduino projects can be independent and interact with computer-operated software. Flash, Processing, Max and MSP for instance. The board has a 16MHz ceramic resonator and is powered by a USB connection.

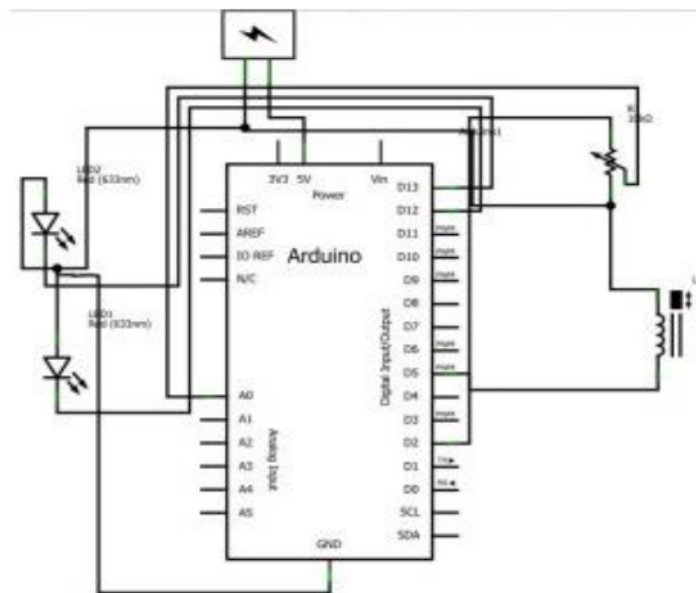


Figure 3.3 AURDINO UNO WITH DIGITAL INPUTS AND OUT PUTS

3.4 FEATURES OF ARDUINO:

Technical drawing of the Arduino Uno R3 PCB showing dimensions in millimeters. The drawing includes a coordinate system with X and Y axes. Key dimensions are labeled: overall width 2700mm, overall height 2100mm, mounting holes at 125mm intervals, USB jack at 1275mm, Power jack at 475mm, and ICSP header at 1590mm. The drawing also shows the location of the ATmega328P microcontroller and the ATmega16U2 USB-to-UART bridge.

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3.5 SOILMOISTURE SENSOR:

The volumetric content of soil humidity sensors is measured in soil water. Because free soil moisture involves extracting, drying and even weighting of the sample in direct gravimetric measures, these sensors indirectly measure the volume content of water using other soil characteristics, such as electrical resistance, neutron interaction, dielectrical constant.

Depending upon environmental factors such as soil type, electrical conductivity, temperature, soil types the soil moisture connection to measured properties must be calibrated and may vary. Rethinking Soil moisture can influence a microwave radiation and is used in agriculture and hydrology for remote sensing. Farmers and gardeners use portable probe devices.

In essence, these sensors refer to the volumetric water content estimating sensors. A different sensor class tests other moisture property in soil, known as the water potential sensor, which typically contains gypsum blocks and tensiometers.

Working of Sensor

The soil humidity sensors, as shown in figure 3.5, consist of two tests, primarily ¹⁴ used to measure the volumetric content of water. The two samples allow the electricity to pass through the ground and then achieve the resistance value to calculate the humidity values. If too much water exists, the soil leads to a higher current, which means a lower resistance. The humidity is a little high. As there is less water, soil does not conduct a minimum stream that ensures that there would be more resistance. Dry soil conducts no electricity. The humidity level is therefore poor. In two modes, analogue and digital mode, this sensor has been associated. We'll connect the analogue mode first and foremost and use it in the digital mode.

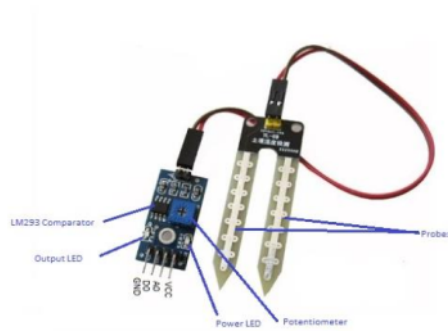


Figure 3.5 MOISTURE SENSOR

4 Specifications

The specifications of the soil moisture sensor FC-28 are as follows

Input Voltage	3.3 – 5V
Output Voltage	0 – 4.2V
Input Current	35mA
Output Signal	Both Analog and Digital

Pin Out – Soil Moisture Sensor

The soil Moisture sensor FC-28 contains four kinds of pins

VCC is ³ for power

A0 is for analog output

D0 is for Digital output

GND is for Ground

This Module contains a potentiometer which sets the threshold value and then the threshold value is compared by the lm393 comparator. The output LED is light down and up according to the threshold value.

3.6 HUMIDITY SENSOR:

In such areas as process monitoring, environmental management and biomedical research, moisture sensing is extremely important. A microfabricated humidity sensor was developed which utilises a microstructure of nitride or silicone suspended to a minimal distance over the surface of a glass suspension and acts as the moving electrode of a condenser. The suspended structure is covered with a vapour absorbing thin film polymers. Due to the moisture changes, a moisture-dependent micro cantilever bend occurs. There are also changes in the capacity between the micro suspended structure and the substrate.

The humidity sensor is generated from the platinum resistor, which is used to compensate the capacitance signal drift that occurs at temperature as a microtemperature detector. A very high relative humidity has shown lower hysteresis values. The wide area of the microcantilever and the less stiffness in the microcantilever have also achieved a high degree of sensitivity. The calibrated moisture capacity or resistance is recorded and the experimental and simulated samples show high linearity and high stability. In the relative humidity range from 20% r.h. to 40% r.h., the average humidity sensor period is 1.10 Sec.

Digital moisture and temperature sensor are based on the planar power technology that combines moisture and sensor temperature in the sensing components.

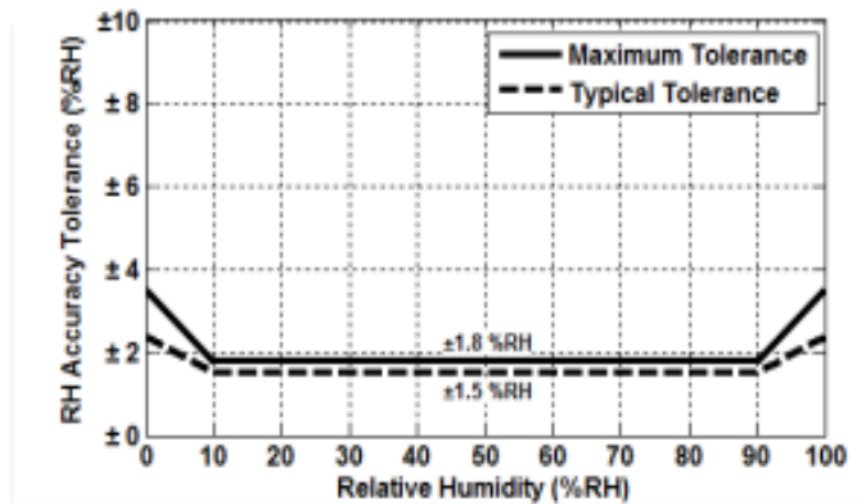


Figure 3.6 TOLERANCE GRAPH

The MVH3201D is the present world's digital sensor of relative humidity and temperature. It is ideal for the most precise applications where sensor efficiency is ideally suited to a variety of environment conditions. Temperature and moisture are one of the essential parameters of the atmosphere, which plays an important role in life and the climate.

APPLICATION OF HUMIDITY SENSOR:

- The humidity sensors has been used in many various applications for measuring humidity in hvac systems ,automobiles , wax machines
- Humidity sensor is also been found as the ²⁷ part of home ventilating , heating, and air conditioning systems . These are also used in industrial spaces , offices, cars, base and greenhouses and museums and are also used in meteorology stations to predict and report weather.

3.7 TEMPERATURE SENSOR:

Figure 3.7 shows the sensor used to monitor and register or signal temperature changes by an electronical system to measure the ambient temperature and transform the input data for electronic data. Many instruments are used to measure the electric signals by the temperature reading. The sensor used is composed of two metals that create electric tension and resistance whenever a slight temperature shift occurs. In industrial applications, temperature is the most common form of physical measurement.

SPECIFICATIONS

Range	0°...100°C
Accuracy	< 0,1°C + NTC-spread over 0°...70°C
Resolution	2 m°C@30°C and 25 m°C@100°C
Linearity	see table
No. Sensors	1...30
Type	5 kOhm NTC-resistors Max. wire resistance 3,3 Ohm
Conditioner	Wheatstone-bridge with +15 Bits ADC
Calibration	at 0°C and 100°C _ 0,1°C
Drift	1 m°C/°C with periodic calibration and 5 m°C/°C without calibration
Scanfreq.	default max. 10 meas./s
Amb.temp	0°...60°
Control	Micro-Wire™ 5 (Di, Do, Clk en CS)
Levels	0 and 5 Volt
Power	+12 Volt 3,5 mAmp (+5,5 +20 Volt) -5 Volt 1 mAmp (-4,5 -8 Volt)
Dimensions	224 x 120 x 60 + 40 mm

The fundamental concept of the temperature sensor operation is to place the voltage through the diode terminal. If the voltage increases, it will also increase the temperature and the voltage decreases between the humidor terminal of the transistor and the diode emitter. Encardio Rite includes a sensor that operates on "the theory of tension changes due to changes in temperature." The vibrating wire temperature metre is determined by the premise that the various metals have a different linear expansion factor with changes in temperature.

It consists essentially of a magnet and high tensile stressed cable, which is attached to the two ends to different metals so that, if the temperature changes directly influence the tension of the cable and its natural vibration frequency.

For the Encardio Rite temperature metre, the dissimilar metal is aluminium. The read out unit, used with other vibrating wire sensors, can be used to measure temperatures as the temperature signal converts to frequency. As temperature changes occur the constructed Encardio rite vibrating wire sensor is sensed and transformed into an electrical signal which is then transmitted to the reader as a frequency. This frequency is commensurate with the tempe and the wire tension μ in turn.

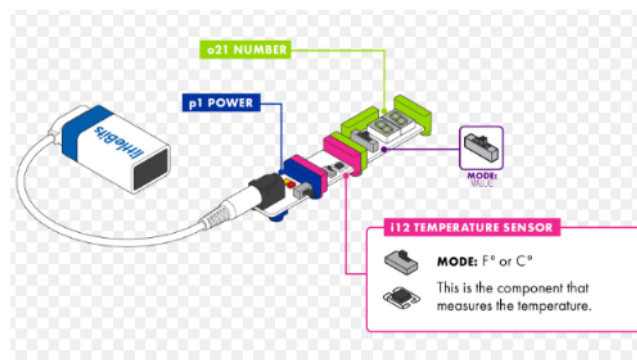
11

$f = 1/2 (\sigma g / \rho)^{1/2} / 2l$ Hz σ is the tension of the wire

g is the acceleration due to gravity

ρ is the density of the wire

l is the length of wire



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Figure 3.7 TEMPERATURE SENSOR

There are several different types of temperature sensors on the market and they all have different characteristics that depend on the actual applications. There are two basic forms of a temperature sensor:

Types of sensor contact temperature

This temperature sensor must be in physical contact with the sensed entity and used to detect temperature changes for conduction. These sensors may be used for detection on a variety of temperatures of solids, gases or fluids.

Non Contact Temperature Sensor, radiation and convection use this form of temperature sensor to detect temperature changes. These sensors can be used to detect gases, liquids that emit radiant energy when temperature rises and cold drops down in convection currents / detect radiant energy from an infrareded material.

Two basic types of contact / even non-contact temperature sensors can also be segregated into the given following three groups of

Electro-mechanical

sensors

electronic and resistive .

Thermostat

This sensor consists of two different metals such as copper, nickel, aluminium or tungsten that can be coupled together to form a bimetallic strip. Thermostat is a contact electromechanical temperature sensor. The two different metals' different linear expansion rates enable a mechanical bending motion when the band is exposed to heat.

The bimetal strike can also be used to monitor hot water heating elements in boilers, hot water storage tanks, ovens and also in vehicle heating systems. The bimetallic stripe is also used as an electrical switch or as a mechanical way to operate an electrical switch in thermostatical controls.

The Bi-metallic Thermostat

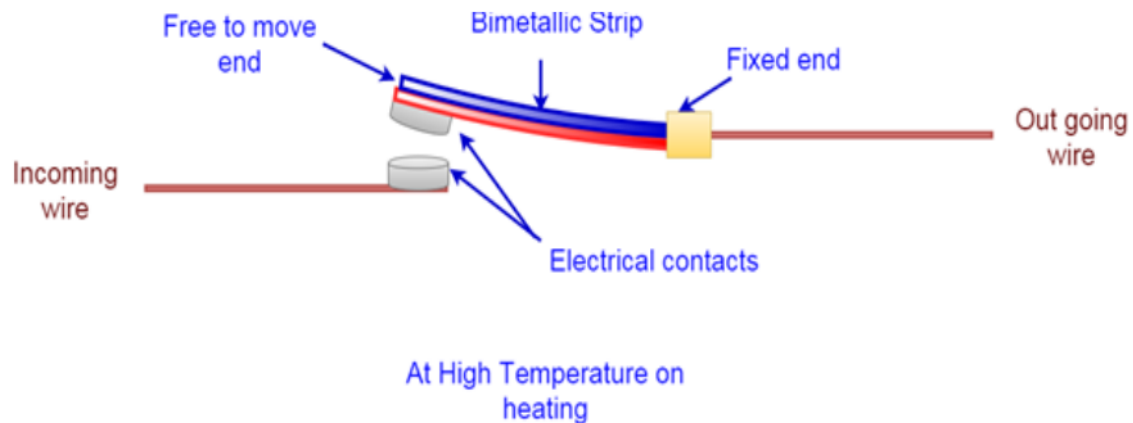


Figure 3.8 BI-METALLIC THERMOSTAT

The thermostat is, as shown in figure 3.8, two thermal metals which are combined back to back. The touch is closed and the current moves through it if it is a cold condition. If the metal is in hot condition, one spreads more than the other and the combined bimetallic strip bends up or down to avoid a flow of electricity.

On or Off Thermostat

Two types of bimetal bands are dependent on movement when subjected to changes in temperature. There is the type of snapaction that spontaneously causes the electrical contacts to move on, off or off at a certain stage of the temperature and the type of slow creeping effect that gradually shifts their location as the temperature changes relatively often.

Snapaction thermostats are essentially used in our house to regulate and track the limiting point of the ovens, imersion hot water tanks, and even to control the domestic heater system on the wall.

Creeper type consists essentially of a bimetal spiral which coils and relaxes slowly if the temperature changes. In general, bimetallic band creeper style strips are more

temperature change sensitive than normal ON/OFF types since the band is long and thin making them extremely suitable for gauges and dials etc.

It's very cost-effective and is usable over a wide range of operations - one of the key disadvantages of the traditional snap-action style thermostat when used as a temperature sensor - which range from when electrical contact open to closing again. For instance, it can be set to 20°C but not open until 22°C or not close again before 18°C.

The temperature range can be very wide. A temperature control screw is used to reset the available bimetallic thermostat for use in the home to provide an accurate temperature and hysteresis setup.

3.8 PH SENSOR

pH is a measured acidity and alkalinity or caustic and basic found in a particular solution, generally used for water measurements. It is usually given a numerical scale of 0-14. Neutrality is a value of 7. With increasing alkalinity the numbers on the scale increase, while numbers on the scale decrease with the acidity. The tenfold changes in acidism or alkalinity occur in each unit of transition. The pH value is equivalent to the hydrogen-ion concentration or hydrogen-ion activity negative logarithm. The table to the right lists pH values for some common solutions.

Combination pH Sensors

Usage of an electrochemical pH sensor is the traditional method used to measure the pH of the soil. One type of electrochemical pH sensor, which houses both the electrode and the reference electrode, is a pH combining sensor. The measurement electrode detects variations in pH where a stable signal for comparison is given as a reference. In order to show the millivolt signal on the unit pH, this high impedance unit is known as a pH metre. In the construction of various product types pH sensors and industry and process pH sensors can be used combination technology.

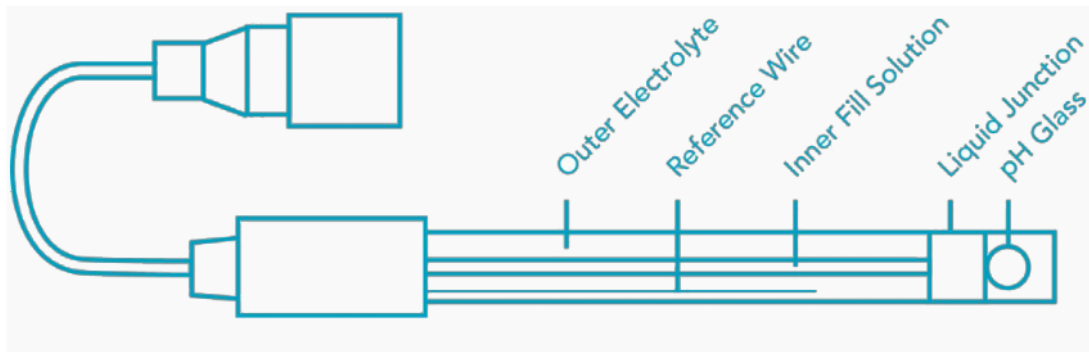


Figure 3.9 PH SENSOR

Common Applications:

- pH neutralization of effluent in industrial and domestic manufacturing environments
- Environmental monitoring
- Cooling tower and boiler control
- Food and beverage quality control and safety
- Odor scrubbers
- Upstream protection of filtration membranes
- Pulp and paper manufacturing
- Water pre-treatment for manufacturing processes
- Swimming pool control
- Blood-gas analysis in medical devices
- Pharmaceutical research & development and manufacturing

OPERATION

Principle of operation

The potentialometric pH metre is used in the voltage measurement between two electrodes to show the result that has been converted to pH. It consists of a basic electronic amplifier and two electrodes, i.e. a combination electrode and a dispersion tuned into pH units. The glass electrode normally is the same as one reference electrode or an electrode mixture. The electrodes/samples are put in the solution to be examined.

The key element is the design of the electrode. These are rod-like structures that are essentially made of glass, with the bulb in the bottom. A pH measurement or electrode fit is made of glass that is specifically designed to be targeted to the concentration of hydrogen-ion. When the hydrogen ions present on the tested solution have to be placed on the glass bulb, which is supposed to be replaced with other positively chargeable ions, generating an electrical potential in the bulb. It recognises the difference in electrode potential in the two measured electrodes and converts the potential difference to pH units. The electronic amplifier is present in it. In linear connection with the pH of the Nernst Equation, the extent of electrochemical potential throughout the glass ampulum.

The reference electrode, which is made of a metal conductor connected to the monitor, is very insensitive to the pH of a given solution. This leader is put in the potassium chloride electrolyte solution, which comes into contact with the test solution via a porous ceramic membrane. The monitor includes a voltmeter that displays the tension in pH units.

A new electronic circuit, which generates and detects the potential difference by the voltmeter, is completed when you place the glass electrodes and the reference element in the test solution. It may be thought that the system extends between the conductive component of the reference electrode and the potassium chloride solution, the ceramic membrane, the test solution and the glass electrode hydrogen-ion selecting glass, and the solution within the glass electrode, to the electrode silver and finally the display device voltmeter. This voltage varies from one test solution to another since the potential difference between the test solution and the other solution within the glass electrode is due to the difference in the hydrogen ion concentration on either side of the glass membrane which. ⁸ All other possible variations in the circuit do not change with pH and are calibrated for.

Many pH metres otherwise use the glass electrode combination sample and the reference electrode that is housed in a single sensor. The article on glass electrodes provides a comprehensive overview of the combination electrodes.

The pH metre is manufactured with the standard pH solutions prior to each usage to ensure accuracy. In order to measure the pH of the solution provided, the electrodes are sampled and placed on the test solutions for long periods enough to balance the hydrogen ions with the ions on the surface of the bulb on the glass electrode for the test solution. The balance ensures a consistent pH calculation.

¹⁰ 3.9 IOT MODULE (ESP8266)

The arduino module ESP8266 is a low-cost Wi-Fi chip with complete TCP or IP capability, and one thing is stunning is the integrated MCU that provides an interface through which to manipulate digital I/O pins through simple near-pseudo-coding, like a language programming. Espressif Systems manufactures this kit.

This chip was viewed in August 2014 by AI Thinker, a third-party manufacturer, in the ESP-01 version module. This module allows the MCU to connect to the Wi-Fi Network and helps to build easy TCP or IP connections. It is a very affordable module, which attracted many Greeks and hackers in a variety of projects. As a true success, Espressif now manufactures several models with various dimensions and technical requirements. ESP32 is one of the predecessors.

one can find over hundreds of projects in the internet and various implementations like data logging solutions, home automation, controlling things over the internet, robotics, even drones.

ESP8266-01 TECHNICAL SPECIFICATIONS:

- 32-bit RISC CPU: Tensilica Xtensa LX106 running at 80 MHz **

- 64 KB of instruction RAM, 96 KiB of ¹⁰data RAM
- External QSPI flash – 512 KiB to 4 MiB* (up to 16 MiB is supported)
- ¹⁰IEEE 802.11 b/g/n Wi-Fi
- ¹⁶Integrated TR switch, balun, LNA, power amplifier and matching network
- WEP or WPA/WPA2 authentication, or open networks
- 16 GPIO pins **
- ²⁰SPI, I²C,
- I²S interfaces with DMA (sharing pins with GPIO)
- UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
- 1 10-bit ADC

3.10 GSM:

GSM is the mobile network which means mobile phones can link to it in the immediate vicinity, by finding the cell. In the GSM network, their areas unit five entirely different cell sizes – macro, microcell, pico, femtocell and umbrella cells. The space of the cell coverage can vary ²⁵according to the context. Macro cells would be considered as cells everywhere since the antenna of the base station is placed on a higher building than the typical rock top. Small cells have a lower height of the antenna and are used essentially in urban areas. Cells with a covering diameter of few metres are terribly small; they are normally used indoors. GSM Associate Degree Indoor Coverage is provided by a victimship of the indoor base station picocell and an indoor repeater with the distributed indoor antenna feeder via power splitters to present radio signals from the outdoor antenna into the separate indoor antenna system distributed. These are primarily used when decision-making capacity is needed indoors, for former centres and airports.

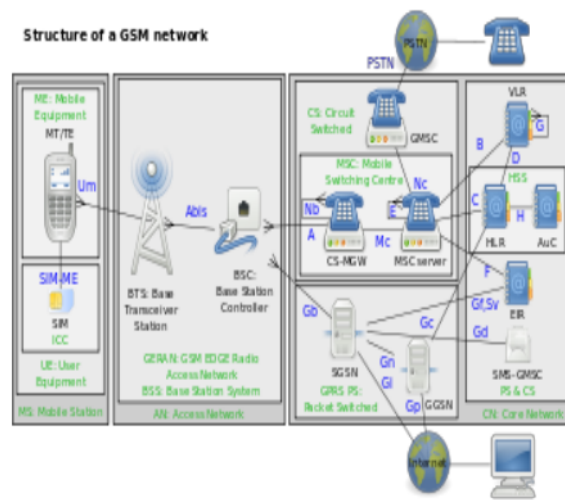


Figure 3.10 GSM NETWORK

The GSM system for communication purposes is developed as a digital systematic with TDMA technology. A GSM digitises and decreases data and sends it through a two-stream channel, each with its own allocated time slot. The digital system is capable of carrying 64 kbps of data rates to 20 Mbps.

GSM ARCHITECTURE:

A mobile station as shown in figure 3.11: This cell phone is made up of the receiver, the monitor and the processor and operated by a network-based SIM card. **Base Station Subsystem:** It serves as an interface between the network subsystem and the mobile station. The base transceiver station includes the radio transceivers and manages mobile communication protocols. It is also comprised of an interface from the mobile and the mobile switching centres which control the Base Transceiver station. **Subsystem Network:** it offers the basic cell network link. The core component of the network subsystem is an MSC providing links to various network sites such as ISDN, PSTN and so on. It also comprises the Home Location Record and the GSM Calling and Roaming Capabilities Visitor Location Record. The Equipment Identity

Register also holds a record of all mobile equipment, in which every mobile phone has its own IMEI number. International Mobile Equipment Identity stands for IMEI.

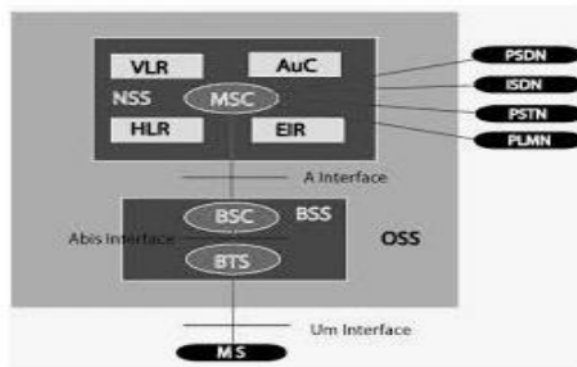


Figure 3.11 GSM ARCHITECTURE

2 TECHNICAL DETAILS :

The GSM network can be divided into three broad parts

- The subscriber will carry the mobile station
- Base station subsystem will control the radio link to the mobile station
- Network subsystem handles the switching of calls
- The mobile users and other mobile and fixed network users

FUTURES OF GSM

GSM is part of wireless mobile telecommunications, along with other technologies including very high-speed, circuit-based switched information, general radio packet systems, the improved Data GSM environment and the universal mobile telecom system.

3.11 DC MOTOR:

A DC engine is one of the major rotating devices for converting electrical energy from direct current to mechanical energy. The most popular form depends on the magnetic

field strength. Close to any kind of DC engine it may be electromechanical or electronic to changing the current flow path periodically in one part of the engine to some kind of internal mechanism.

DC motors are the first type to be commonly used because they can be operated from the existing power distribution system for direct electricity lighting. A variable supply voltage or a change of currents power in field windings may also be used to operate a speed channel DC motors across the broad range. In tools, toys, and appliances, small DC engines are used. It is also a lightweight brushed motor which can be powered by direct current, but it is only for portable power tools and appliances. In propulsion, hoists, elevators or roller mills for steeling, Large DC engines were used. DC motors have been replaced with AC motors in many applications through the advent of power electronics.

WORKING:

The DC engine is the electric energy transforming machine in a rotation in the form of mechanical energy. Its moment is created by electromagnetism's physical behaviour. The DC motors are inductors inside which the magnetic field used for the movement is generated. However, if the DC current is used the magnetic field will shift.

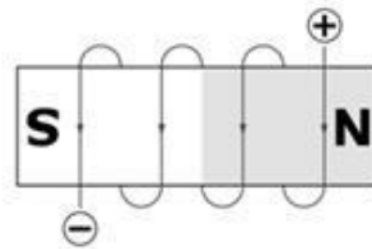


Figure 3.12 ELECTROMAGNET

This may be ¹ a piece of iron wallpapered with a wire coil which has tension applied at its terminals, as shown in Figure 3.12. If there are 2 fixed magnets on either side of this magnet, as shown in figure 2.13, then the torsion can be generated by repulsive, engaging forces.

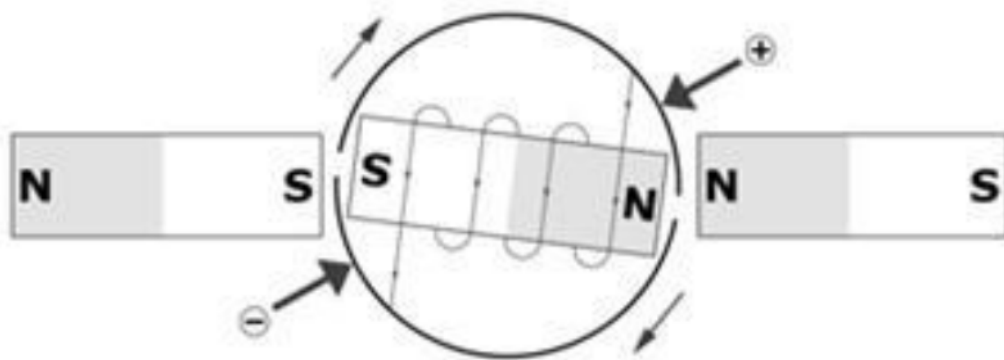


Figure 3.13 TWO FIXED MAGNETS ARE ADDED TO THE ELECTROMAGNET

There are also 2 problems to resolve: to supply the present spinning magnet without twisting the wires, and to resolve any problem dynamically with two devices at the right time, namely a scattering ring switch and 2 pins.

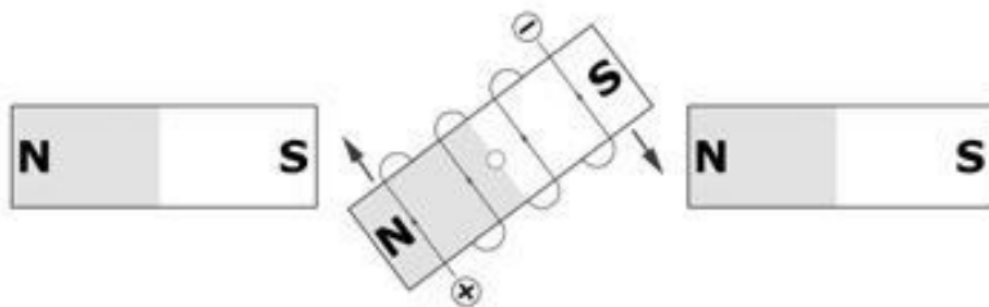


Figure 3.14 ROTATING ELECTROMAGNET

As shown in figure 3.14, the switch is made up of two segments which are connected to each electromagnetic device terminal; the brushes which help to apply electricity to rotary electromagneten are independent of the two arrows. It is built into 3 slots instead of 2 and 2 brushes in actual DC motors.

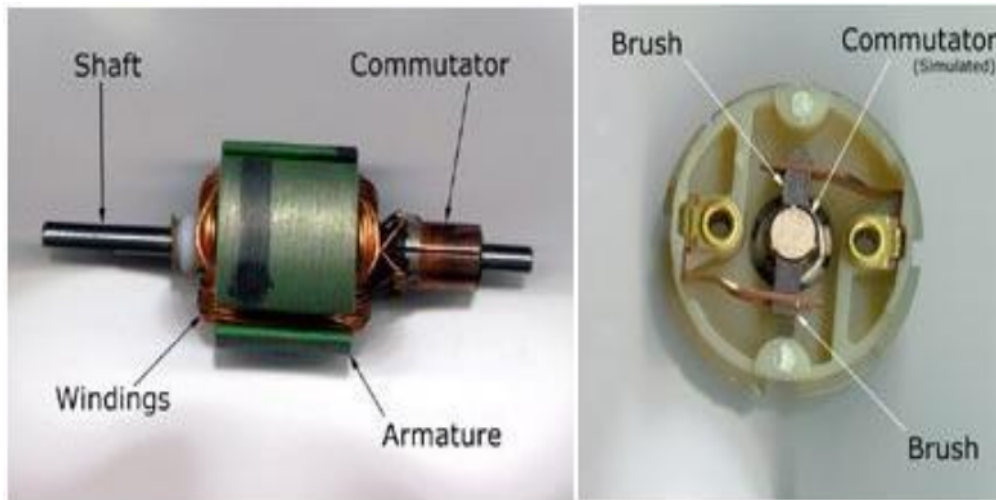


Figure 3.15 DC MOTOR

As the electromagnet films the polarity continues to change and the shaft can continue to rotate. While it is simple, and sounds fantastic but there are few problems, which do not make the motors mechanically stable and inefficient, the key problem lies in the timing of each polarity inversion. Where polarity changes mechanically in an electromagnet at few speeds polarity very early changes that can lead to reverse impulses and, often, spontaneous turn-out. It causes mechanical instability, whatever the case may be.

CONTROL OF DC MOTOR:

The DC engine has only two connections, as shown in Figure 3.16. The engine is able to operate if the voltage is applied to the terminals. When the terminal is changed, the engine changes direction while the motor runs and shuts down abruptly. All terminals. Per terminal. The engine will however continue to spin quickly until it stops. If the motor works and you abruptly stop the engine when it is short on both terminals. Thus, no third cable is used to power a DC motor, so we also consider how to control it. The H-Bridge Care Assistant is also the solution.

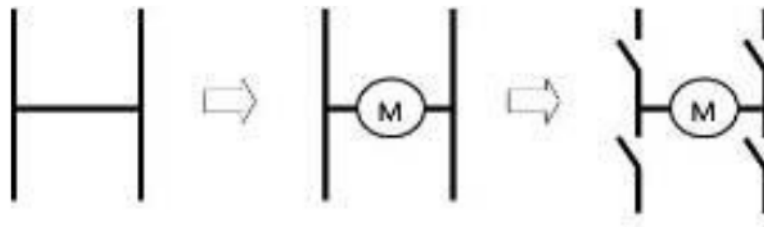


Figure3.16 WORKING OF DC MOTOR

If you look at the latest DC motor development above, you will find ¹ that there are four doors and a motor connected between them. This is the simplest H-bridge, where the four gates are transistors. By operating the door and connecting the upper and lower terminals to a voltage source, the motor ¹³ can be controlled in all modes as shown below.

Main Types of DC Motors

Understanding the various DC motor types can also allow you to understand the use and form of DC motors used for different applications.

There are 4 main types of DC motors:

1. Permanent Magnet DC Motors

In order to generate the field flow, the permanent magnet motor uses a permanent magnet. This form of DC motor has a high starting torque and very good speed control, the torque is limited, so it ¹³ can be found basically on a low power.

2. Series DC Motors

The field is wound in a DC series with a couple of turns of a long wire that carries the entire frame current. Series DC engines usually produce large ¹³ starting torque but cannot speed control and can be damaged without load. These limitations mean that variable speed drive applications are not a good choice.

3. Shunt DC Motors

The field is associated with armature windings in the Shunt DC engines in parallel (shunt). The shunt fields can be excited separately from the rear windings, which also have simpler reverse controls, and provide high-speed regulation.

4. Compound DC Motors

Compound DC motor have a separately aroused shunt area, as have shunt DC motor
Compound DC motor have strong starting torque, but control problems can occur in applications for variable speed drives.

SOFTWARE DESCRIPTION

- Arduino IDE.
- PHP

3.12 ARDUINO IDE:

As shown in Figure 3.17, the Arduino IDE is very basic, but for most Arduino projects it offers an almost complete setting. The top menu bar contains standard options including file (new, save, archive, etc.), editing (source, copy, paste, etc.), skizze, sketch and "instrument." (Useful test item options) and assistance. At its heart, you can insert software codes in a simple text editor. The bottom of the IDE is used for the output window used to view compilation stats, such as how much memory was used, if any bugs in the source code and many other useful messages are found.



Figure 3.17 ARDUINO WINDOW

Sketches are named projects provided by Arduino. These sketches are normally written in a C++ version simplified (not having C++ features). Since programming for microcontrollers is not computer-based, they vary from device libraries (for example, changing the output mode, outputting data to pins, reading analogue values and timers). Often this confuses users who believe Arduino is programmed in 'Arduino.' Arduino is designed for C++, however. Use device-specific libraries only.

The 6 Buttons

While many more advanced projects will take the advantage of the built in tools present in the IDE, all the projects will depend on the six buttons found below in the menu bar.



Figure 3.18 BUTTON BAR

The button bars

As shown in the figure 3.18

You can verify the code with the check mark. Click here after the code has been completed or the code has been written. Arrow is going to upload the code for execution to Arduino. A new file is made by the paper pointed out. To open up the current Arduino project, the up arrow is used. Using the down arrow, the current file is saved. The button on the far right is the serial monitor that is useful for debugging data from the Arduino to the PC.



Figure 3.19 SOURCE CODE WINDOW

As shown in Figure 3.19, the GNU General Public License version 2 contains the sourcecode for the IDE. The Arduino IDE has special rules to structure the code with the C and C ++ languages. This project offers many traditional procedures for check-in and check-out.

The code that is written by the user requires two main features, to perform the sketch and loop for the main programme, to compile it and link it to the main() programme stub, which can use the GNU tool chain contained within the performed IDE. distribution. distribution. The Arduino IDE uses the avrdude software to convert executable code in a hexadecimal encoding text format, which is loaded by a loader to the Arduino board in the firmware of the board.

Sketches are named projects provided by Arduino. These sketches are normally written in a C++ version simplified (not having C++ features). As the programming of microcontrollers is different from that of machine, there are several options: libraries for particular devices (such as changing the output mode, outputting data to pins, reading analogue values and timers). Often that confuses users who believe that Arduino is programmed in the language of "Arduino."

Arduino is designed for C++, however. Using only device-specific libraries. Using basic code structure rules Arduino IDE supports C and C++ languages. A software library from the wiring project, providing several popular input and output routines, is provided with the Arduino IDE. The user-written code only requires the sketch and the main programme loop to perform two main functions. These functions are compiled and connected to the main() in the GNU loop executor, also included in the distribution programme IDE.. The functions are compiled. The Arduino IDE converts the executable code in a hexadecimally coded text file using the avrdude software and then loads it into the Arduino card using the motherboard firmware bootloader programme.

3.13 EMBEDDED C:

Embedded C is a programming language hottestll liked|preferred|most favourite} for electronic gadget creation. The embedded software is connected to any processor employed in the electronic system. Incorporated C programming is a crucial part of the processor's performance. We use many electronic devices in our everyday lives similar to cell phones, washing machines, digital camera etc. The functionality of this system is based on an embedded C microcontroller.

C code is favoured over other languages in embedded machine programming. Because of these reasons:

- o Easy to comprehend

- o High confidence

- o Transferrability

- O Scaffolding

A function is a set of statements for a particular purpose and the programming language is a collection of one or more functions. The programme that provides functions on a device is known to many customers. Incorporated software, however, is normally less convincing. Unlike software for applications, firmware has set hardware specifications and features and regulates strictly the inclusion of any hardware or software from third parties.

The appropriate system controllers at the time of production must be in the firmware and device drivers for specific hardware should be written. The programme depends very heavily on the processor and the microcircuit selected. At least some experience of reading circuits is available to most embedded software developers. To evaluate the usage of registers and communication systems, read the part table. It is just like bit manipulation to convert between decimal, hexadecimal, and binary numbers. Web applications are seldom used, and there are usually no computer file systems and databases for XML files or other results.

In software development, a cross-compiler that runs on a machine and generates execution code for the target device is needed. Debugging involves an emulator, JTAG or SWD in-circuit system. Software developers generally have access to the full source

code of the kernel (OS). There can be large variations in the storage devices and RAM. Some systems run 16 KB of flash memory and 4 KB of ram with 8 MHz processors, whereas other systems can run on modern computers. Such room needs to be supplemented. Not in C++ in C or embedded C++. Interpreted languages, including BASIC (and BASIC-compiled E.Parallax Propellers) and Java (Java ME Embedded 8.3 for earlier e.ARM microphones in Raspberry Pi and Intel Galileo, Cortex-M7 and ARM11). It is possible to use the controller gene. 2) The MicroPython language interpreted by Python 3 for use on microcontrollers, 32-bit ARM-based microcontrollers (such as the BBC: micro:bit) and 16-bit pics are used for explicit implementation; but not for universe use. It is important to communicate between processors and between processors and other components. Popular protocols include I2C, SPI, serial interface, USB as well as direct memory addressing. Specifically for embedded systems communication protocols are available as a closed source from companies such as InterNiche. The technology and CMX system open source protocol come from uIP, lwip and some keywords: bit

- sbit
- sfr
- small
- large

CHAPTER 4

RESULTS , CONCLUSION AND FUTURE SCOPE

The project consists typically of a central arduino one with other pieces. This iot module serves as a hub for connecting various types of sensors including moisture sensors and humidity sensors. Sensors are attached to their location and the sensors forward data to the iot module consisting of an integrated wireless Internet connection technology. On the Internet there is a cloud where sensor values are changed every second in real time. The user can check the parameters anywhere.

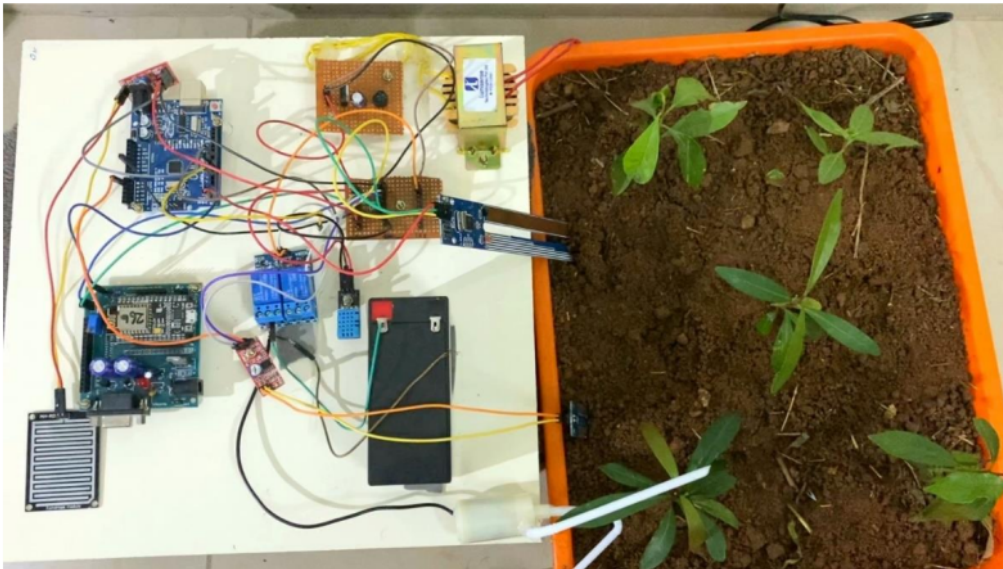


Figure 4.1 FINAL APPEARANCE OF THE PROJECT

CODE WHICH IS COMPILED AND EXECUTED

The project was carried out with Arduino IDE's latest edition. The code in the source code window has successfully been searched and run, only when the Arduino board has been linked to the laptop can be executed.



```
ph_monitor | Arduino 1.8.13
File Edit Sketch Tools Help

ph_monitor
#include <dht.h>
dht DHT;
#define DHT11_PIN 8
#define soil A1
#define motor1 6
#define motor2 7
void setup()
{
  Serial.begin(9600);
  pinMode(soil, INPUT);
  pinMode(motor1, OUTPUT);
  pinMode(motor2, OUTPUT);
}
void loop() {
  int chk = DHT.read11(DHT11_PIN);
}
```

Done compiling.

Sketch uses 7030 bytes (21%) of program storage space. Maximum is 32256 bytes.
Global variables use 283 bytes (13%) of dynamic memory, leaving 1765 bytes for local variables. Maximum

Figure 4.2 SOURCE CODE

DIALY STATUS SHOWED IN THE MOBILE

Daily satus is been shown in the below figure 4.3 . this information can be checked by the end user in his or her mobile with the given link from any location

LogID	DATA	Logdate	LogTime
4	Temperature_=_34.00Humidity_=_60.00	02/26/2021	17:05:14
9	A=	02/26/2021	17:06:16
10	PH_Value8.00	02/26/2021	17:06:28
12	Moisture_Percentage_=_0.00	02/26/2021	17:07:20
19	PH_Value37.65	02/26/2021	17:09:11
29	Moisture_percentage_=_42.00	02/27/2021	14:46:15
37	UV[	02/27/2021	14:48:03
85	A=	02/28/2021	12:36:21

Figure 4.3 DAILY STATUS

4.1 CONCLUSION

Project reflects the IOT kit. It is fitted with certain sensors including moisture, temperature, humidity and PH. In this package the quality of the soil is provided to the end user through the GSM module, where the data is regularly displayed. This package offers mobile telephone applications for information to end users. This project is beneficial and the farmers and children can easily handle the system. The system is implemented with additional "sensors," such as "temperature" and soil-humidity sensors. The system includes the dc motors to adjust the ground humidity and Ph in the ground. The Wi-Fi is a remote control for electronic devices.

4.2 FUTURE SCOPE

In this report, the issue of conventional gardening systems has been tackled. The data are captured and transmitted to a central cloud server via the temperature, moisture, and ph sensors. In addition, users receive all information about the garden and can also use their mobile devices to communicate with it. With the addition of new sensors and valves, the established device can also move in the field fertilisers and the other agricultural chemicals (calcium, sodium, ammonium, zinc). The device can be used for both commercial and agricultural gardening purposes. The improvement of our project is possible by adding a webcaper that can forecast the plants' water and weather. If the plants are predicted to have less water. In order to estimate water used for irrigation and therefore to estimate the cost, a water metre can be built. To change the water flow rate, a solenoid valve may be used. In addition, wireless sensors can be used as well.

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