

AQUAPONICS SYSTEM MONITORING AND CONTROLLING USING IOT

Submitted in partial fulfillment of the requirements
for the award of
Bachelor of Engineering degree in Electronics Communication And
Engineering
By

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**Department Of Electronics Communication And Engineering
SCHOOL OF ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC
JEPPIAAR NAGAR, RAJIV GANDHI SALAI,
CHENNAI – 600 119**

MARCH - 2021



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING BONAFIDE CERTIFICATE

This is to certify that this project report is the bonafide work of **K.YASWANTH KUMAR (Reg. No. 37130213)** and **K.NAGA BHAGATH (Reg. No. 37130201)** who carried out the project entitled "**AQUAPONICS SYSTEM MONITORING AND CONTROLLING USING IOT**" under my supervision from **August 2020 to March 2021.**

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Submitted for Viva-voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

We **K.YASWANTH KUMAR** and **K.NAGA BHAGATH** hereby declare that the Project Report entitled “**AQUAPONICS SYSTEM MONITORING AND CONTROLLING USING IOT**” is done by me under the guidance of **Dr.M.SUMATHI ,M.E., PHD** Department of Electronics Communication And Engineering at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics Communication and engineering.

DATE:

PLACE: CHENNAI

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **the Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr.N.M.Nandhitha, M.E., Ph.D., Dean**, School of Electronics, **Dr. T.Ravi, M.E., Ph.D., Heads of the Department** of Electronics and Communication Engineering for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Dr.M.SUMATHI M.E., Ph.D.**, for her valuable guidance, suggestions, and constant encouragement that paved way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Electronics and communication Engineering** who were helpful in many ways for the completion of the project.

ABSTRACT

Food security is a recurrent concern for many countries around the world, such as Singapore. The project expands on the design and construction of the home environment aquaponics system, which can reduce the country's total food needs if every household in any country manufactures its own fish and plants. To continuously track, automate and record aquarium water and ambient air quality, the proposed smart and stable home aquaponics device features a microcontroller with multiple sensors, motors and internet connection. The rich feature mobile application (IoT) ensures the good growth of fish and plants by sending users an early warning if the device malfunctions. In addition, sufficient triggers to correct errors are automatically initiated in a timely manner. To increase fish and plant growth, plant growth lights and fish feeders are also automatically controlled. The results of the measurements show that a planned aquaculture system with reduced maintenance costs and human intervention can effectively develop safe fish and plants.

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CHAPTER 1

INTRODUCTION

1.1 EMBEDDED SYSTEM:

An embedded machine is a special purpose controller in a large mechanical or electrical system configured and operated by a real-time operating system (RTOS) with the limitations of real-time computing.

It is commonly used as part of a larger device containing mechanical equipment and parts. Most devices that are popular today are controlled by embedded systems. The included hardware components make up 98% of the total microprocessors.

Low power consumption, compact gauge, strong operating ranges and low unit cost are some of the features of traditionally built-in computers that are more than the general utility equivalent. It comes at the expense of rare computing power, which makes programming and communicating with them even more difficult.

However, by installing intelligence mechanisms on the devices, potentially enhancing the installed sensors and having a network of embedded modules, the resources available at the device and network level can be improved, as well as further enhanced capabilities. Currently available. Smart Energy Management strategies can be developed, forexample.

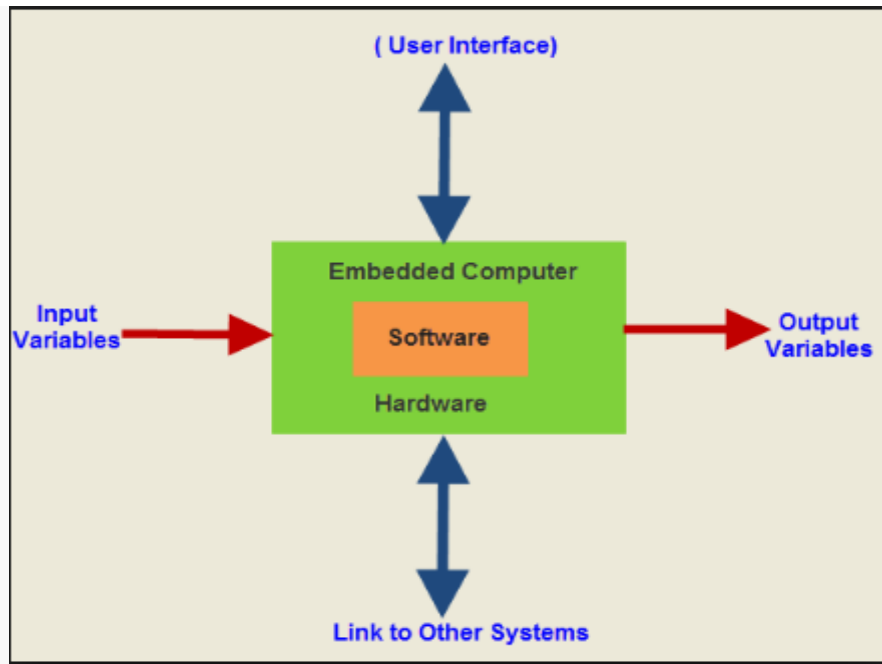


Fig 1.1 Embedded system

Computer embedded subassembly for electronic voting machine.

Consumer, agricultural, automotive, medical, private and military applications all use built-in hardware.

The services of communication use a wide range of integrated systems, from network connectors to cellular end-users. For guiding data across computer networks, special routers and network bridges are used.

MP3 players, mobile phones, video game consoles, handheld cameras, GPS receivers, and printers are examples of consumer electronic equipment. Embedded systems are used to offer flexibility, efficiency, and features in home appliances such as microwave ovens, washing machines, and dishwashers.

1.2 CLASSIFICATIONS OF EMBEDDED SYSTEMS:

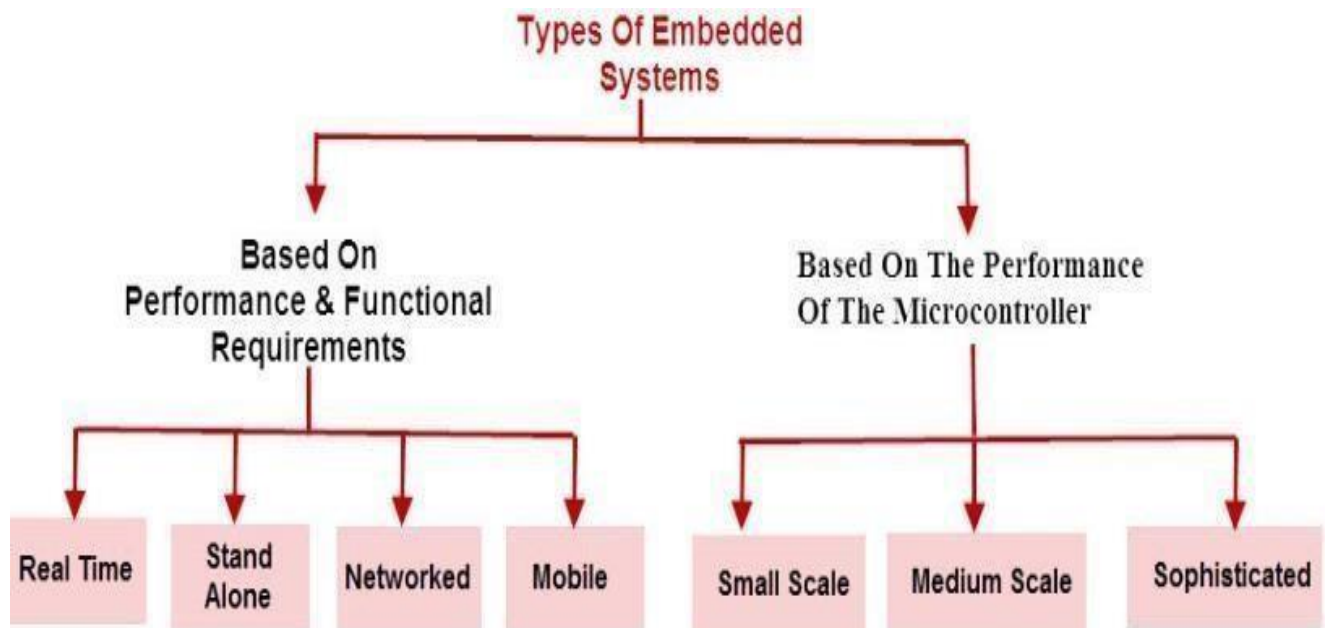


Fig 1.2 Embedded system classification

Advanced HVAC systems use grid-connected thermostats to more accurately and efficiently monitor day and year temperature fluctuations. Home automation uses wired and wireless networks to monitor lighting, temperature, protection, audio / video systems and monitoring systems, many of which rely on built-in sensors for sensing and control.

Common examples include traffic lights, plant controllers and highly sophisticated equipment such as hybrid motors, MRI and avionics. Examples of systems that incorporate portable gadgets such as digital clocks and bulk static matches from MP3 players. Complexity ranges from simple (with one microcontroller) to complex (with multiple microcontrollers).

1.3 BLOCK DIAGRAM OF AN EMBEDDED SYSTEM:

The processor is usually included in the device. Included devices are found in many products that provide wireless display, such as microwaves, video equipment and cars. The operating system is used in some built-in devices. Others are very unique, ending up implementing the whole logic into a single application. These devices are integrated into the computer using proprietary rather than general-purpose computing.

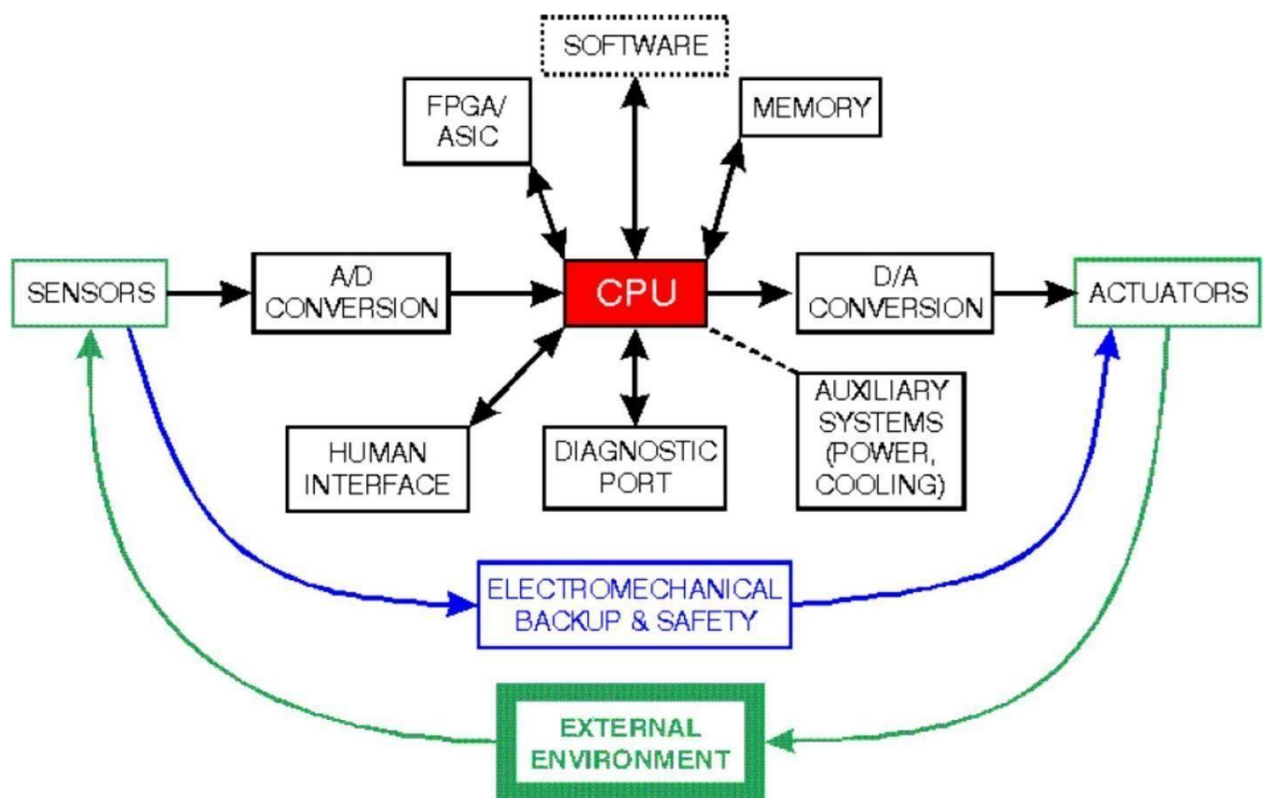


Figure 1.3 Typical embedded system block diagram

1.4 EMBEDDED SYSTEMS APPLICATIONS:

- Powertrain, Cruise Control, Body Protection, Engine Safety, Assembly Line Robots, Vehicle Multimedia, Car Entertainment, E-Com Connectivity, Cell Phones and Other Automotive Embedded Systems
- Networks, mobile computing and cellular networks are examples of

technologies embedded in communications.

- Systems included in smart cards include banking services, telecommunications and authentication services.
- Security, communication and space in systems embedded in satellite satellites and missiles.
- Ed Image editing, networked networks, scanners, network cards, monitors and displays are examples of embedded systems for computer networks and peripherals.
- Set-top boxes, DVD players, HD televisions and built-in cameras are also examples of embedded systems for digital consumer products.

CHAPTER 2

LITERATURE SURVEY

2.1 LABORATORY AQUAPONICS SYSTEM VIA PLC AND LABVIEW

In this project, a laboratory aquaponics system, which is developed to teach undergraduate students at Dalian Ocean University, Liaoning, China, some of the issues regarding aquaponics based on PLC and LabVIEW, is discussed. In this aquaponics system, to maintain the ecological balance of the water body, Siemens S7-1500 PLC is used to realize data acquisition and automatic control of various sensors and execution devices. LabVIEW programming is used to develop a friendly human-machine interface to realize data display, storage, query, and analysis. Finally, the real-time data exchange is completed through OPC communication technology, and the monitoring of the aquaponics system is realized. Experience in using this system in undergraduate teaching indicates that it supports learning of PLC and LabVIEW related courses and it also in line with the marine fisheries characteristics of our school.

2.2 Design and implementation of automated aquaculture system for indoor cultivation

The combination of hydroponics and aquaculture is called aquaponics. It is an aquaculture method in which fish waste is used to feed plants grown in the water, which purifies the water. Plants and fish work in symbiosis in this environment. To successfully recycle this aquaponics scheme, the growth success of the comet goldfish was tested against the cilantro plant, a variety of greens and a water plant. The fish are fed commercial pellet feed containing 30% crude protein, which provides all the nutrients needed for plant growth. In this scheme, auto feeders play an important role in maintaining the growth and survival rate. Filters are used to filter water and get rid of waste and decomposing materials.

The required amount of water, the temperature to be monitored in the aquarium, the temperature to be monitored in the plant area and the desired amount of food settings. Although Arduino acts as the brain, it receives data from the sensor and responds with instructions in the form of feedback. The action then depends on the trigger that responds to the obtained action.

2.3 Aquaculture equipment and intelligent control system

Conventional agriculture and aquaculture have problems with the widespread use of water and land resources, and water pollution is a problem that is difficult for humans to solve. The popularity has increased due to aquaponics, recycling agriculture and lifestyle, population growth and food security issues. Aquaponics is a modern agricultural treatment technology that includes aquaculture and aquaculture. As a result, growing vegetables no longer requires fertilization, and fish farms no longer need regular water adjustments. As a result of this transformation fish, harvested crops and microorganisms are now developing mutually beneficial symbiosis and peaceful coexistence in ecologically balanced relationships. It combines hydroponics and recycling aquaculture technology to achieve water and nutrient recycling, as well as low pollution, high productivity and efficiency. In this article, traditional equipment and its production possibilities will be studied, along with hydroponics, the main vegetable growing system in aquaculture and the main equipment for water purification in aquaculture. Nutritional cycling involved in the monitoring and control of greenhouse ecosystems, water quality and intelligent aquaponic system have all been studied and captured. This paper assesses the current state of aquaculture technology and methods, as well as future development trends. Photocabonics is becoming smarter with the advancement of technology. intensive, accurate, and efficient.

CHAPTER 3

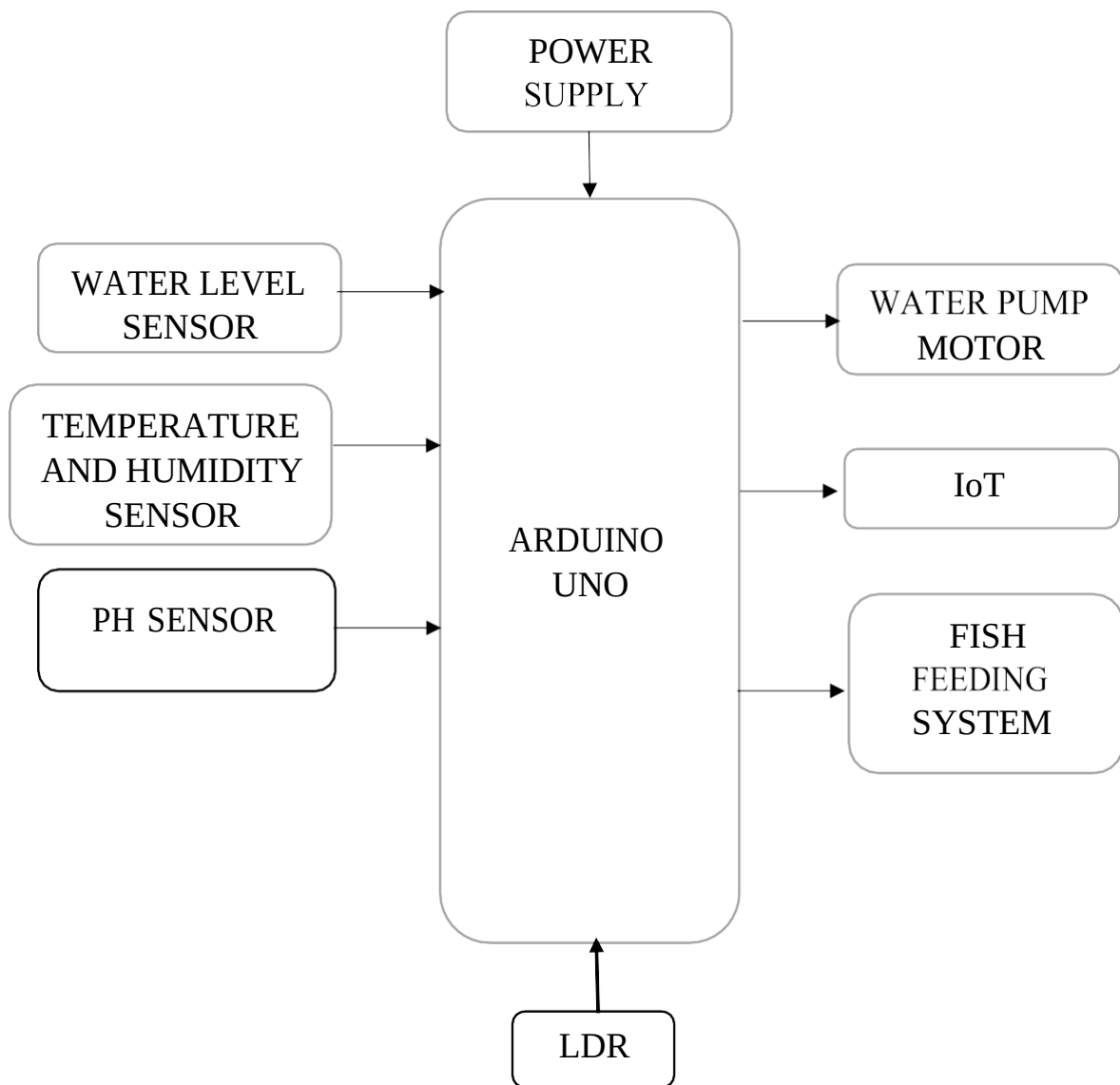
3.1 EXISTING SYSTEM:

- The existing device also monitors the temperature of the air and water, as well as humidity, pH, and water level.
- The data collected from the parameters is only tracked by the Arduino microcontroller and is not safely processed or used for more real-time study.

3.2 SYSTEM PROPOSED:

- In the proposed framework, sensor readings are tracked and shown to the consumer in real-time through the Internet of Things, and then safely forwarded to an online spreadsheet for storage and review.
- We propose utilizing the cloud to monitor the machines from anywhere.

3.3 BLOCK DIAGRAM:



HARDWARE REQUIREMENTS:

Arduino UNO

- Temperature sensor
- Humidity sensor
- LDR
- Water level sensor
- Ph sensor
- ESP8266
- Water flow motor
- Fish feeding system

SOFTWARE REQUIREMENTS:

- ARDUINO IDE
- EMBEDDED C
- PHP

CHAPTER 4

HARDWARE COMPONENTS DETAILS

4.1 ARDUINO UNO:

The microcontroller ATmega328 is used for the Arduino Uno (datasheet). It has 14 digital I/O pins, six of which are available as PWM outputs, a ceramic 16 MHz resonator, USB connectivity, power port, ICSP header and a reset button. This feature includes 14 digital I/O pins. It comprises everything you need, including USB cables to be connected to a device and an AC-to-DC converter or battery to be powered by a microcontroller. The fact is that Uno doesn't use the USB to serial drive chip is different from previous boards. The serial adapter is instead driven by a USB based on Atmega16U2 (Atmega8U2 via R2). The resistor on the Uno board revision 2 pulls the 8U2HWB line to earth, making it simpler to reach DFU mode. The following additional functionality are used in the Board of Directors' third review:

Pin 1.0 Pinout: The AREF pin has SDA and SCL pins, and the reset pin, IOREF, has two additional pins that enable the shields to react to the voltage provided by the board. Shields would be compliant with all AVR-based 5V boards in the future, as well as the 3.3V Arduino Dew board. The second is a pin that has been disconnected that will be visible in the future.

- Reset circuit that is more effective.

U Super 16U2 can be used instead of 8U2. "Uno" is derived from the Italian term "uno," which means "just." This song has been chosen to commemorate the introduction of Arduino 1.0. From now on Uno and Version 1.0. The Arduino Uno USB is the newest board and reference model for Arduino; comparisons to previous iterations can be found in the [Arduino board index](#).

STRENGTH:

The VIN is the reference voltage of Arduino when an external power supply is used (as opposed to 5V from a USB connection or other controlled power source). This pin may be used to provide voltage or to check if a power jack is providing power.

The voltage is 5 volts. The regulator sends a powered 5 heater to this pin board. A DC control socket (7 - 12 V), a USB connector (5 V), or a VIN pin (7 - 12 V) on the board may both be used to power the board. To provide a voltage that is higher than the regulator which does harm to the board, use the 5V or 3.3V sticks. This is not anything we suggest.

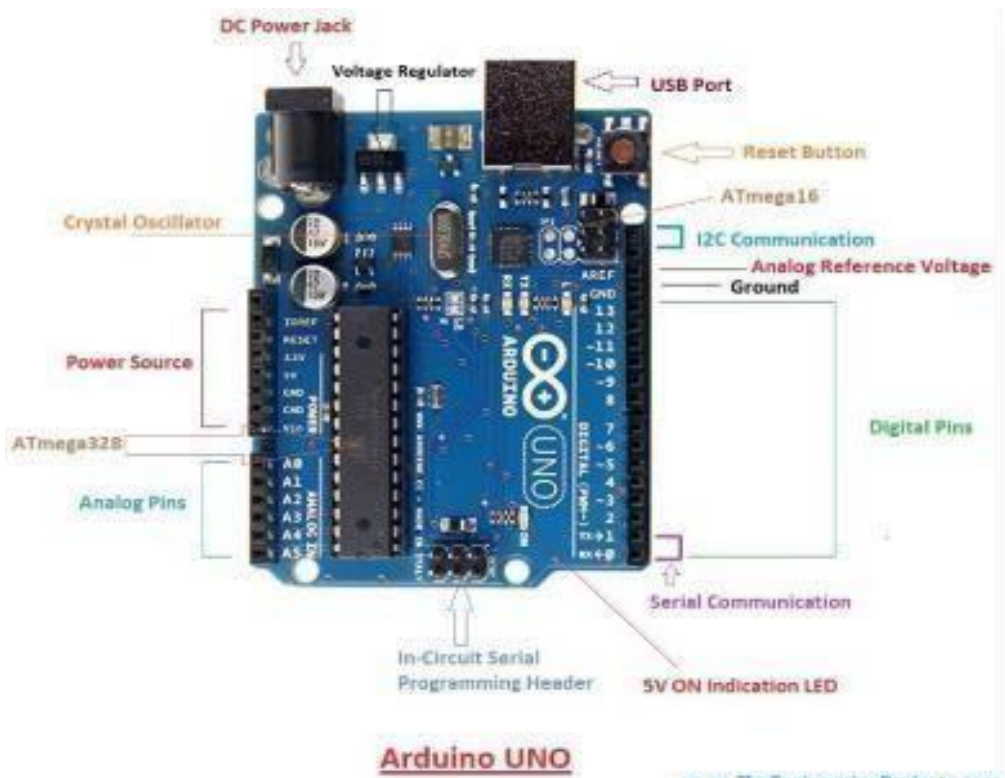


Fig 4.1 Arduino Uno diagram

The V 3V onboard regulator produces a 3.3V supply. The total drawn

current is 50 mA (mA).

GND is a general term for a group of milled pins.

Remember:

The cache of the ATmega 328 is 32 KB (uses 0.5 KB for the bootloader). There are up to 2 KB SRAM and 1 KB EEPROM on the desk (which can be read and written using the EEPROM library). All Uno 14 optical pins can use the output and input pin mode (), digital write (), or digital read out () to provide input or output. 5 volts is used to fuel these. Each pin has a 20-50 kOhm internal pull resistor that is disconnected by default that can supply or receive up to 40 mA.

Aside from that, certain dowels serve various purposes:

1 (TX), 0 (RX) in serial (TX). This computer receives (RX) and transmits (TX) TTL serial data. These pins are wired to the ATmega8U2 USB-to-TTL serial chip's corresponding port wires.

These pins trigger interruptions when there are 2 or 3 external interruptions on the lower value of the value, such as a margin rise or decrease or a shift of value. For more details see the additional interrupt function ().

3, 5, 6, 9, 10, and 11 watts PWM • PWM: 3, 5, 6, 9, 10, and 11. • PWM: three, five, six, nine, ten, and 11. The analogue type function can stream 8-bit PWM ().

SS (SS), MOSI (MOSI), MISO (MISO), 13 (MISO) SPI: SS (SS), MOSI (MOSI), MISO (MISO), 13 (MISO) SPI: SS (SS), MOS (SCK). To interface with these pins, the SPI library is used.

There are 13 LEDs total. A wire connects the integrated LED 13 to a digital

pin. The LED switches on when the pin is high and the pin is small, and the LED disconnects. Uno has six analog inputs with a resolution of 10 bits, starting from A0 to A5 (i.e. 1,024 different values). By design, they scale from 0 to 5V, but the AREF pin and analog comparison () function may be used to change the upper end of the spectrum. Some nails are used for various purposes, such as:

TWI: A4 (SDA) and A5(SCL). The cable harness supports the TWI touch.A couple more staples can be found on the board:

Are you looking for a unique way to express yourself (Arctic Research and Education Foundation). Provides a reference voltage for analog input. Use in conjunction with an analog guide ().

Start the creative process once again. To reset the microcontroller, set this line to low. The reset button is sometimes used for shields that prevent resetting the board. Also see ATmega328 port configuration and Arduino pin configuration. The routing is the same on the Atmega8, 168, and 328. Arduino Uno has a number of communication options for attachment to other computers, the Arduino or other microcontrollers.

The ATmega328 UART supports TTL serial (5V) (TX) on 0 (RX) and 1 optical pins (TX). The onboard ATmega16U2, which appears as the default com port for programs on the computer, redirects this USB serial link. As the 16U2 firmware uses regular USB COM drivers, there is no need for an extra driver.

However, a.inf file is necessary for Windows. The Arduino app comes with a serial monitor to move text data simply from the Arduino board to the computer. During the data transfer to the serial port via USB and USB connection, RX and TX LEDs on board flash (but not for serial connection on pins 0 and 1). Using the Serial Software Library, serial communication may be achieved on any Uno Digital PIN. I2C (TWI) and SPI connectivity are supported by the ATmega328.

I2C bus use is made easier with the Wire library, which is provided with the Arduino program. See the documentation for additional details. Use the SPI library for your SPI message.

PIN CONFIGURATION:

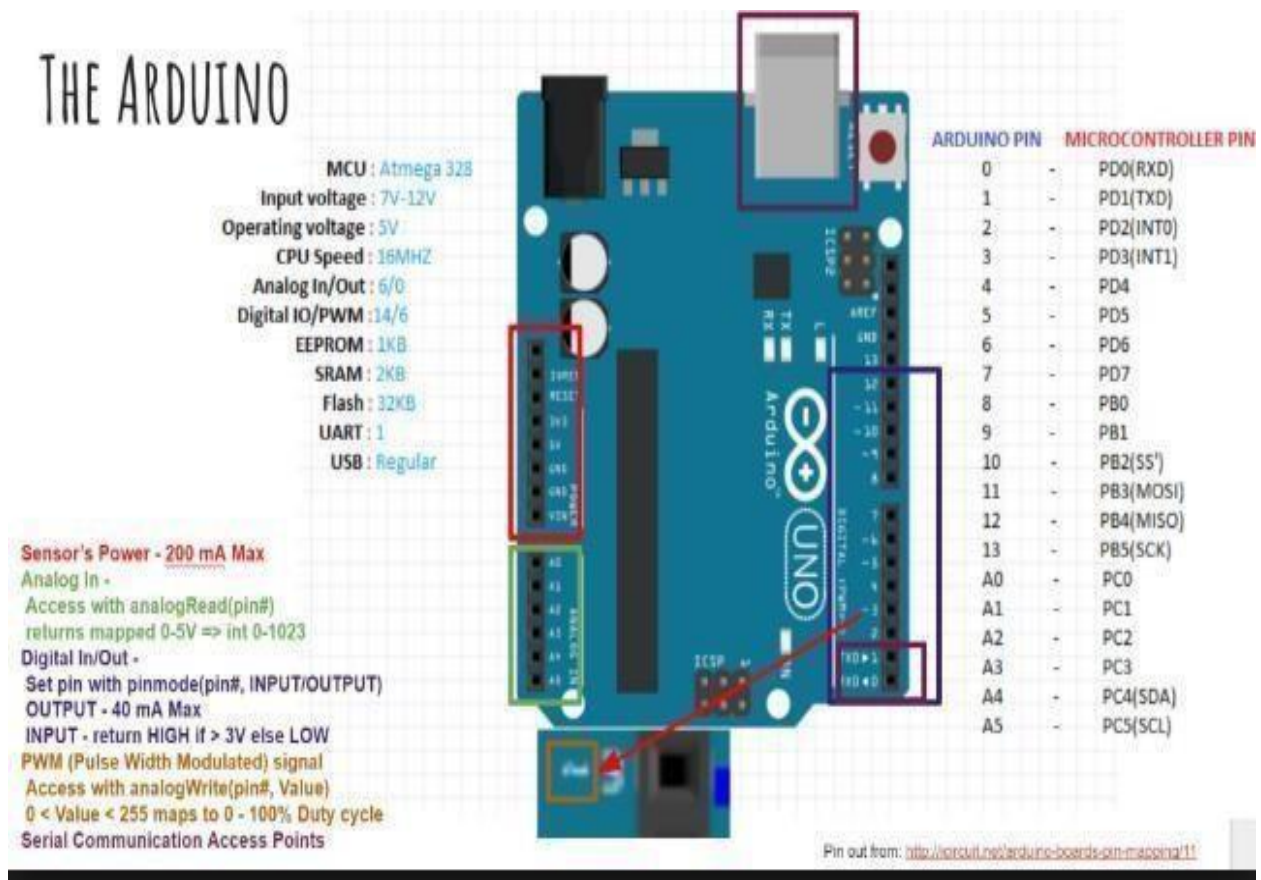


Fig 4.2 Pin diagram of Arduino Uno

Over-current USB Protection:

Arduino Uno has a variety of customizable fuses that make it impossible to override the computer's USB ports. About the fact that most computers have built-in encryption, Fuse provides another layer of protection. The fuse will automatically cut the connection if more than 500mA is connected to the USB port before receiving additional or less load.

Physical characteristics:

The Uno PCB is respectively 2.7 and 2.1 cm high and exceeds a combined length and width of the USB connector and power jack.

As in the case of the previous, the panel is fastened with four screw holes

to the deck or case. The width between the optical pins 7 and 8 is 160 millimeters (0.16 inches), which is not a coefficient equal to 100 millimeters for other pins.

4.2 Temperature sensor:

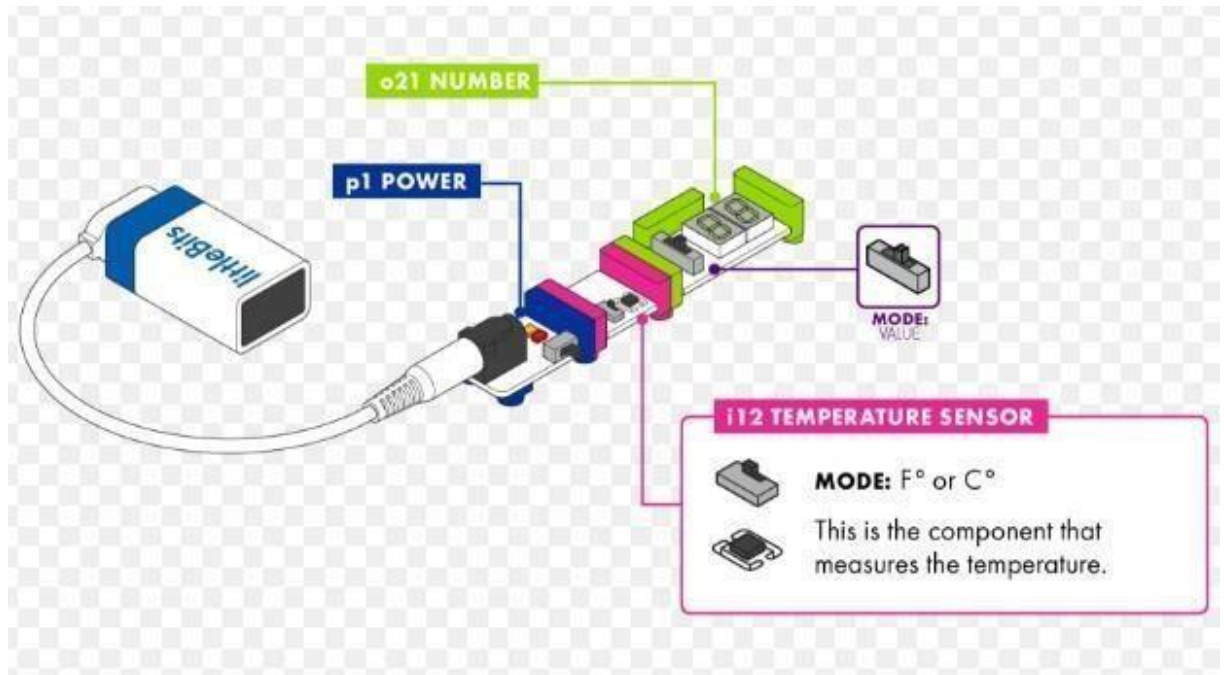
"Every day, the weather is getting colder." This sentence began to appear a few times in our daily lives. We are still seriously thinking about what is in it. What is the Hottest Choice? How hot is it? Is it colder than water or slightly hotter than cold? Temperature is a subjective assessment of our human senses. For objective and regenerative calculation we need to calculate the temperature values and to do this we need an appropriate measuring device.

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

4.2 Temperature and its Measurement

Simply put, temperature is a measure of the enthalpy of the body and describes it as body temperature. No problem was found in calculating the enthalpy of an object on a scale until the steam engine arrived. The need for scientists to better understand the behavior of water at different types of enthalpy has led to a more systematic and more structured analysis. The term "temperature" was first used by Joseph Black in 1760, stating that adding the same material to different materials results in different temperatures. As a result of many years of scientific research, he sees heat as a physical substance that can be shared between substances, from the basic principle of 'calories', until Cornet defined heat as a source of energy (which laid the foundation for the first law of thermodynamics). However, none of them adequately explains the temperature formula. Maxwell's hypothesis has a strong basis for this. He described body temperature as a thermal property that provides knowledge about the energy content of a system. It refers to the calculation of the average kinetic energy (kinetic energy) of a substance and the high energy of heat in which heat moves from high temperature to low temperature.



Temperature sensors come in a variety of shapes and sizes and each has its own characteristics depending on its use. There are two basic physical forms of temperature sensors:

Temperature Touch Temperature Sensor Models - These temperature sensors must be in close contact with the detected material and detect changes in temperature by circulation. Solids, fluids, and gases can be tracked over a broad range of temperatures.

Models for contactless temperature sensors - Those sensors detect changes in temperature through convection and convection. It can be used to determine the radiant energy emitted by liquids and gases when heated and cooled in heat streams, or to determine the radiant energy emitted by an organization in the form of infrared radiation (the sun).

The following three categories of temperature sensors can be divided into two main classes of touch temperature sensors or non-contact temperature sensors: sensors,

1. Electrification

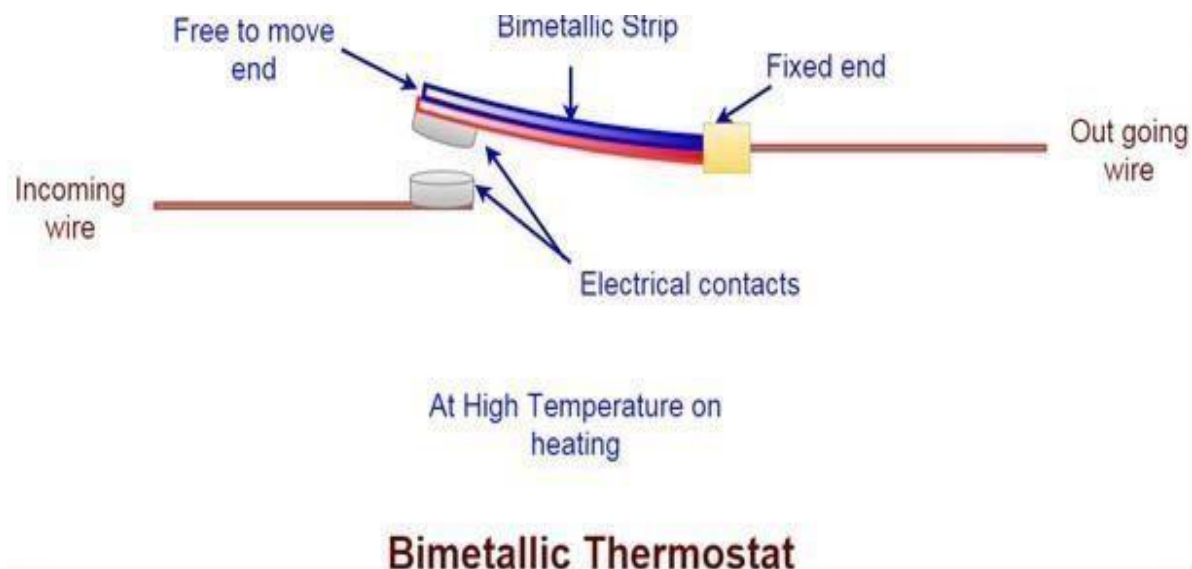
2. Electronic and resistor.

3. Temperature controller

The thermostat is a switch made of electromechanical temperature monitor or two different metals, combined to form a bimetallic strip such as nickel, copper, tungsten or aluminum. When the tape is heated, the different linear expansion velocities of the dissimilar metals cause mechanical bending.

Bimetallic tape is widely used to operate hot water heating components in boilers, furnaces, hot water storage tanks and vehicle cooling systems, and can be used as a switch or mechanical means to control a switch in thermostatic controls.

The Bi-metallic Thermostat



The thermostat consists of two metals with different thermal properties, which stick to each other. Connections are closed when the weather is cold and current passes through them.

As the heating and cooling system expands faster than one metal when heated, the bimetallic strip bends (or down), opening the contacts and blocking current traffic.

Thermostat (on / off)

Bimetallic strips are classified into two classes according to how they travel when subjected to temperature fluctuations. There are different types of "snap-on" that provide a sudden "on / off" or "off / on" action on electrical contacts at a constant temperature phase, and "creep motion" types, which are kept at a slow temperature change.

Snap thermostats are widely used in our homes to control the temperature of ovens, irons and submersible hot water tanks, as well as to control the home heating device.

Reptiles have bimetallic or coil coils that are gradually twisted or twisted with increasing temperature. Because the creepy pattern bimetallic strips types are longer and thinner than the normal snap of on / off, they are more flexible to temperature changes. It is suitable for use in thermometers and tablets, as well as in other applications.

When used as a temperature sensor, traditional snap mode thermostats have a wide range of attenuation from opening the electrical contacts to closing them again, although they are inexpensive and can be used over a large operating range. For example, it can be set to 20 C but not open to 22 C and not close to 18 C.

As a result, the temperature fluctuations are very large. Temperature control screws in commercially manufactured bimetallic thermostats for home use pre-set the most accurate and precise optimal temperature set point and idle temperature.

4.3 Humidity sensor

Moisture sensing is useful in environmental monitoring, road mapping, and biomedical science. The temperature monitoring elements provide a nitride/silicon microstructure

suspended at a small distance above the top of the condenser and platinum film resistor surface. The suspended chassis is coated with a vapor-absorbing substance called polyamide. Depending on the humidity of the narrow cantilever, differences in humidity appear to bend. It modifies the measured capacity of the partial suspension system to the surface.

The humidity sensor is connected to a platinum resistor which serves as an accurate temperature detector to offset the temperature-induced diffuse signal drift. At higher relative humidity, a lower hysteresis value is indicated. Higher sensitivity is also achieved due to the wider electrode area at the tip of the microcontroller and the lower rigidity of the microcontroller. Both simulated and experimental models show strong and linear stability and are calibrated with relative humidity and capacitance / resistance. With a relative humidity range of 20% RH to 40% RH, microcontroller based humidity sensors have a fixed time average of 1.10 seconds.

Temperature and humidity sensors are integrated into the sensing component of the ST automatic temperature and humidity sensor, which is built on planar capacitance technology.



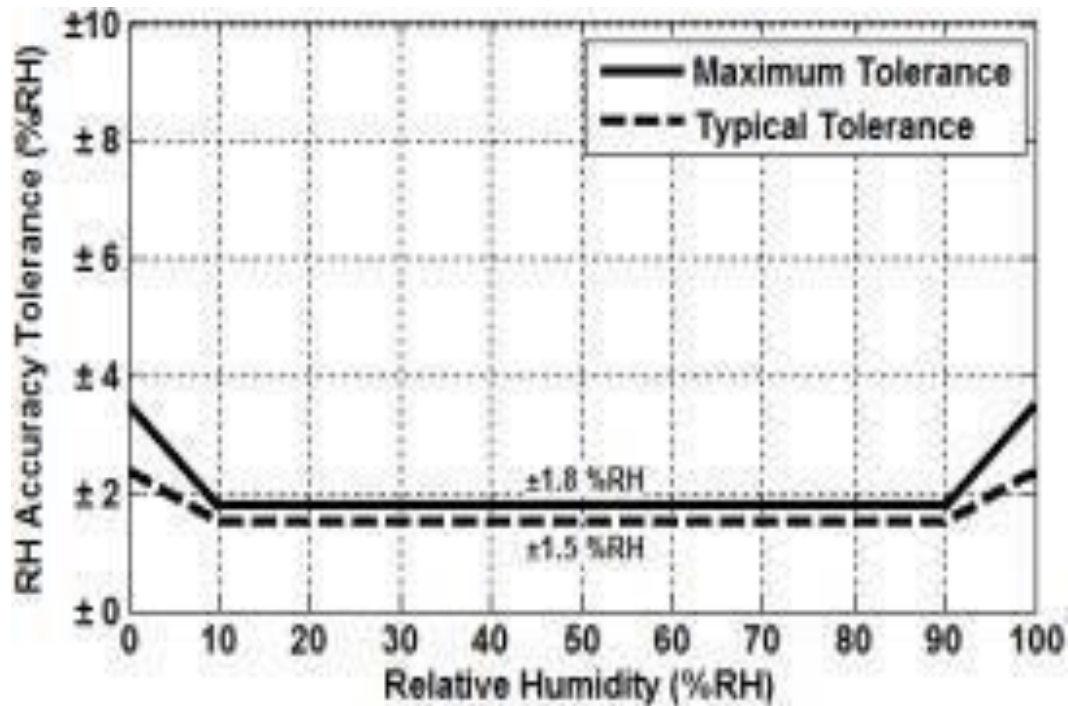
The MVH3201D is the world's most sensitive micro-optical temperature and relative humidity monitor. It is ideal for high-precision applications where the output of the sensor should be optimal in a wide range of environmental conditions.

Humidity and temperature are two common environmental variables that have a major impact on people's lives and the environment.

Humidity sensor applications:

Humidity meters have a variety of uses. Humidity meters are used in homes to detect and prevent disease in people affected by moisture.

In domestic heating, ventilation and air conditioning (HVAC systems), humidity sensors are frequently used. It is often used for weather reporting and assessment at weather stations, as well as in offices, vehicles, refreshments, libraries, manufacturing sites and greenhouses.



4.4 WATER LEVEL SENSOR:

Level sensors are used to measure and monitor the amount of liquid flowing into a closed chamber. Level sensors are commonly used to track fluids, but they can also be used to monitor solids such as powders. Industrial scale sensors are commonly used. Liquid level sensors in cars are used to track a wide variety of materials, including gasoline, oil and, in rare cases, specialized fluids, including power steering. They are also used in commercial storage tanks and in kitchen appliances such as pasta as well as coffee machines. Basic level sensors can be used to detect whether a material is falling or exceeding the minimum or maximum level. Most sensors may have a fixed volume calculation by describing the exact liquid in the container relative to the minimum / maximum values.

WATER LEVEL SENSOR



A variety of liquid level sensors are useful for detecting liquid point levels. Magnetic float, which rises and falls with the fluid in the tube, is used in many forms. Fluid, and a magnetic switch is induced from the reeds when the magnet reaches a certain amount. Typically, the bottle has a switch between the top and bottom, which allows it to find the minimum and maximum liquid volumes. A protective shield with several sensors is also used to protect the magnet against turbulence or interference caused by close interaction with the fluid.

General Considerations for Liquid Level Sensor Selection:

- Vapors mist and dust
- Density and viscosity
- Interfaces and gradients
- Ambient temperature
- Chemical composition
- Process temperature
- Humidity/moisture
- Regulated environment
- Process pressure

The method of measuring and determining point level is described in this article, but systems for continuous level detection and measurement are briefly discussed

in the following paragraphs. Two similar level measurements are covered by these two measuring devices.

SPECIFICATIONS

- 1 Product Name: water level sensor
- 2 Item :. K-0135
- 3 Operating voltage :. DC5V
- 4 Working current : less than 20mA
- 5 Sensor Type : Analog
- 6 detection area :. 40mm x16mm
- 7 Production process :. FR4 double-sided HASL
- 8 mounting hole size : 3.0mm
- 9 user-friendly design : half-moon -slip handle depression
- 10 Working temperature :. 10 °C -30 °C
- 11 Operating Humidity : 10% ~ 90 % non -condensing
- 12 Weight :. 3g
- 13 Product Dimensions : 65mm x 20mm x 8mm

Point/ Liquid Level Switch Measurement and Detection Systems

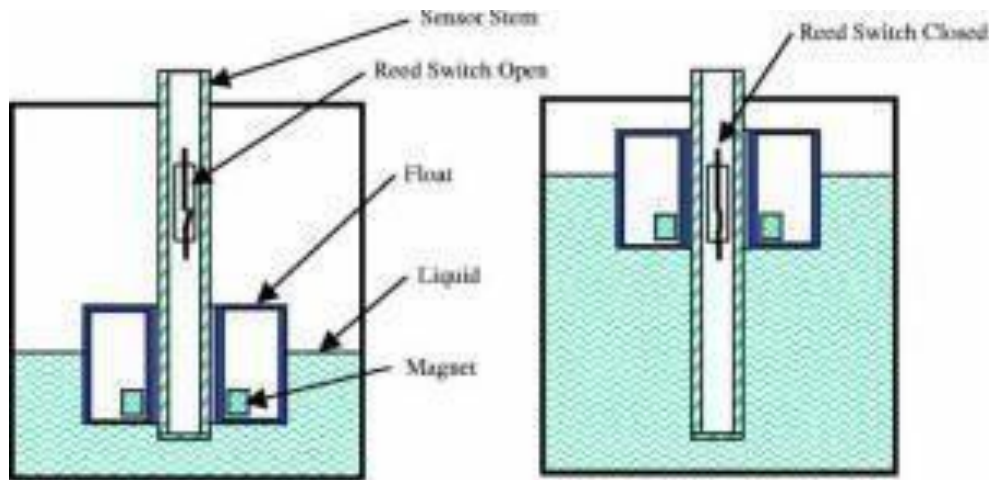
Sensors that determine point level are used to label a single liquid level or to pre-adjust the level . Usually this sensor is used as a coil

A low alarm that acts as a marker to record high alarm or low alarm conditions that use liquid level sensors to monitor overflow conditions in containers. Here are the different classes of sensors:

Floating sensor

- Capacitance sensors are a type of capacitance sensor.
- Conductivity detectors

Level Detection and Measurement by Using a Float Sensor



Level detection Concept of operating a liquid level controller using a floating sensor: The liquid level control system using a floating sensor operates on the principle of floating, which is "proportional to the weight of the displaced fluid being pushed up by pushing the submerged floating force into a fluid". As a result, it partially pushes the body and sinks into the liquid floor, covering a distance equal to the liquid level.

Fiction:

Booi, sensor stem, magnet, read rotation and weight level gauge float suspended outside the open tank. A scale is a device that measures the size of an object.

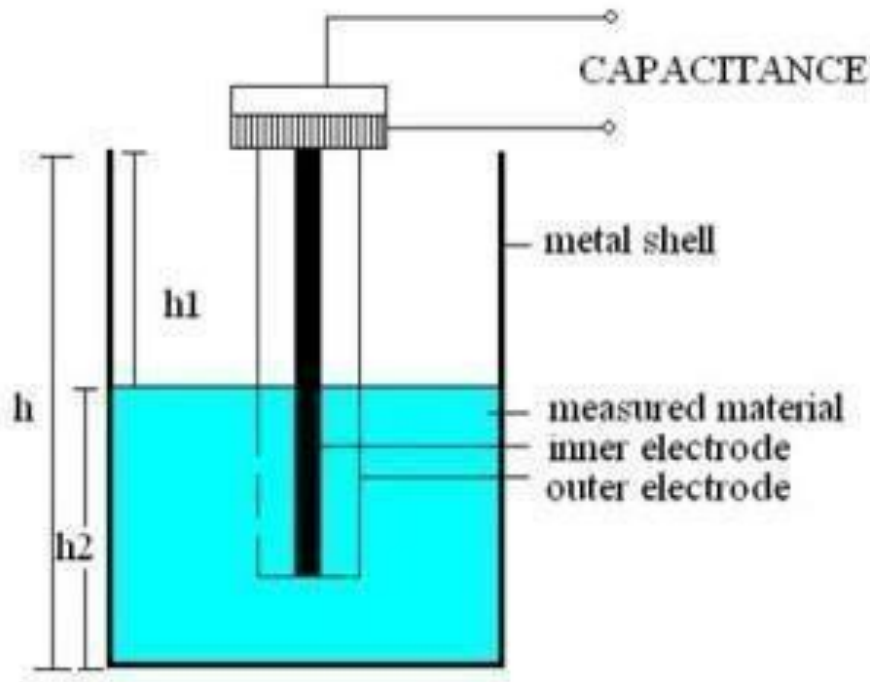
Tank level contents are displayed by the weight position around the scale, which is mounted on the outside of the tank.

Working conditions:

Floating type liquid level transmission is commonly used to determine liquid level. As the level moves up, the float turns into a mechanical lever or sliding shaft and launches the lever. When the liquid level rises and returns to its original position, the float has a small magnet that changes the position of the switch. This form of scale sensor has many advantages, including ease of use, good accuracy

and compatibility with a wide range of objects.

Level Detection and Measurement by Using Capacitance Sensor



Capacitance sensor to detect level

Solids, aqueous fluids, organic liquids, and pastes will all benefit from capacitance level sensors. Radio frequency technology is a term used to describe this process.

Application of frequency signals to an amplitude circuit. Capacitive sensors can detect materials with flux gray ratios ranging from 1.1 for coke to 88 for water or other liquids.

Principle of service: Capacitance difference is the basis for calculating the capacitance level. The capacitive sensor consists of two panels: one acts as an insulating electrode and the other as a tank wall. Capacity is proportional to the liquid level. The smaller the empty tank capacity, the stronger the full tank

capacity. The primary capacitor separates the two electrode plates with a thin layer of dielectric (solid, liquid, vapor or vacuum).

4.5 PH sensor

PH is the ratio of acidity and alkalinity, or the amount of caustic and base substance in a solution, and is widely used in water calculations. The numerical scale from 0 to 14 is commonly used to express it. The number 7 indicates neutrality. With increasing alkalinity, the numbers increase on a scale, and with acidity, the numbers decrease. Ten times the deflection of acidity or alkalinity is indicated by each unit change. The rationality as hydrogen ion or the negative logarithm of hydrogen ion reaction is also equal to the amount of pH. The table on the right shows the pH values for several common solutions.

The pH sensors are in one group

The electrochemical pH sensor is the most common form of pH calculation. Compound pH sensors are electrochemical pH sensors that contain a measuring electrode and a reference electrode. The measurement measures the electrode pH changes, while the reference electrode produces a constant signal of contrast. The millivolt signal is shown in pH units with a high resistance device called a pH meter. The combined use of pH sensor technologies helps.

Various devices such as laboratory pH sensors and process or mechanism pH sensors can be manufactured using this technology.



Common Applications:

- Boiler control and cooling tower
- Offset pH of liquid waste in industrial production environments
- Odor purifiers
- Environmental monitoring
- Upstream protection of filter membranes
- And monitoring the quality and safety of food and beverages
- Swimming swimming pool control
- Pre-treatment of water for production processes
- Cement research, development and preparation
- Pulp and paper making
- Analysis of blood gases in medical devices

OPERATION

Operating Principle

Transform the voltage metres into a pH value to measure the voltage between the two electrodes. It includes a pH calibration screen, an electrode pair or an electrode combination, and an electronic amplification system. A glass electrode is typically used, with reference electrode or composite electrode. In the research solution, electrodes, also known as detectors, are injected. [Eight] Electrode structure is critical: These are rod-like glass buildings with an underlying bulb housing the sensor. To measure the pH, a glass bulb specifically developed for rationing is used as the hydrogen ion in the glass electrode. The hydrogen ions in the measuring liquid interact on the solutions that are submerged by other positively charged ions in the glass bulb that creates an electrochemical potential throughout the lamp. The electronic amplifier recognises and transforms into pH units the potential difference between the two electrodes generated during measurement. According to Nernst theory, the extent of the chemical potential around a glass lamp is proportional to the pH.

The pH of the solution varies at the reference electrode, which is made up of a metal conductor attached to a screen. This leader is immersed in an electrolyte solution, usually potassium chloride, which is made available through a pore ceramic membrane to the test solution. On a monitor, a voltmeter shows the voltage in pH devices.

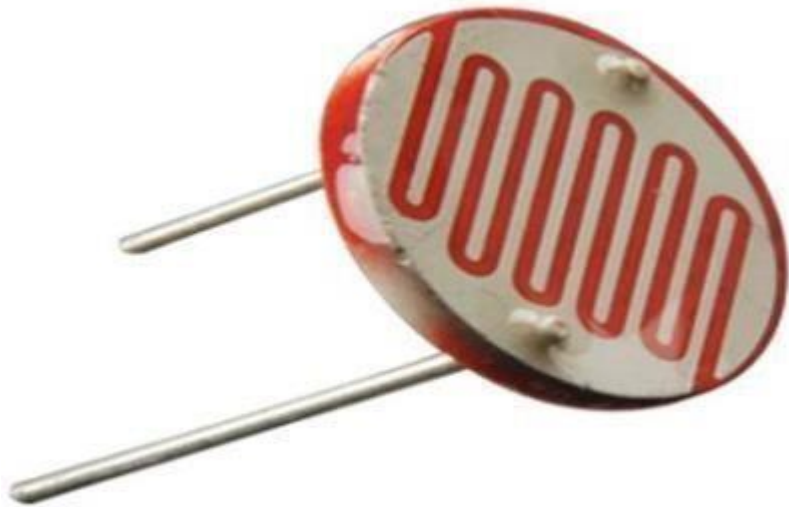
A potential gap is created by immersing the glass electrode and the reference electrode in the measuring fluid, resulting in an electrical circuit with a potential gap marked by a voltmeter. From the conductive element of the reference electrode to the surroundings, the circuit can be shown to operate via the ceramic membrane to the test solution, via the hydrogen ion selective glass in the glass electrode and through the solution within the glass electrode. It is made of silver

glass and is derived from the plate display by the voltmeter. [10] [9] The potential variance from the tension test solution to the voltage test solution within the glass electrode due to changes in the hydrogen ion concentration on both sides of the glass membrane is different. Titration is used to adjust for some circuit deviations that do not vary from the pH.

A hybrid probe, which incorporates a glass electrode and a reference electrode into a single probe for ease, is used by most pH meters. In the article on glass electrodes there is a detailed description of hybrid electrodes. Until each application, the pH scale is modified using validated pH solutions to ensure correct measurement. The electrodes are immersed in test fluids and left there as samples for a long period, allowing for pH determination through the balance of the hydrogen ions with the ions on the glass electrode surface. This balance keeps a constant pH read.

4.6 LDR

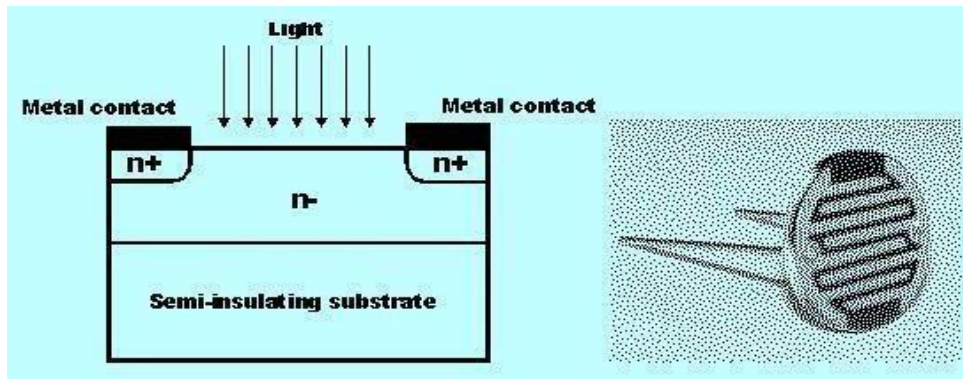
Lighting and equipment are usually done by hand in certain ways. However, the device-operated approach's control is lost owing to human error or unnatural circumstances. This problem can be resolved with a light-dependent resistor circuit to track light intensity loads. A photoresistor, also known as an LDR, is a high-resistance semiconductor chip. The aim of this article is to explain what an LDR (Light Dependent Resistor Circuit) is and how it operates.



Light Dependent Resistor

Construction of LDR

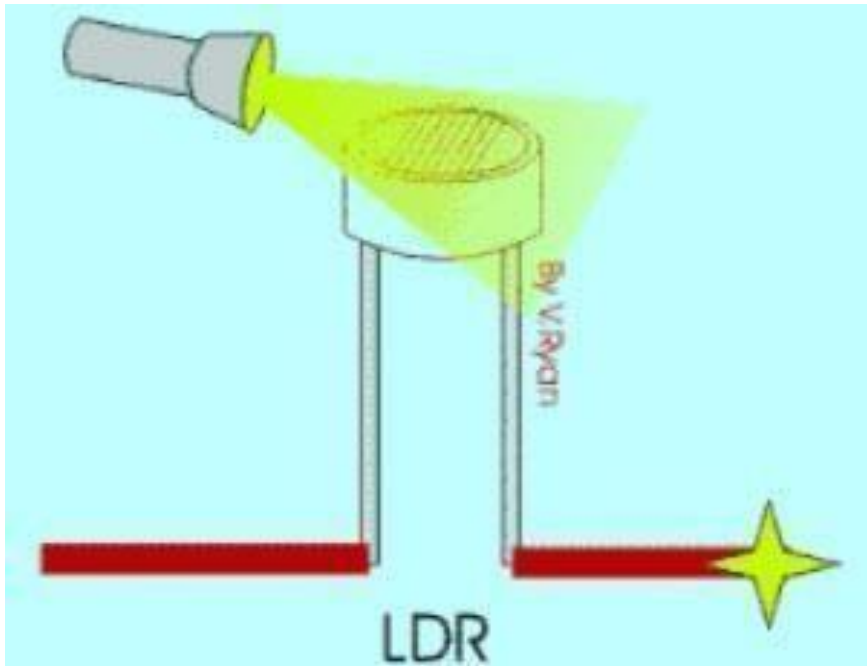
LDR consists of a photosensitive material attached to an insulating layer such as ceramic. To achieve the required strength and resistance rating, the material is placed in a zigzag pattern. The zigzag divides the mineral areas into two.



Outside the field or at the margins, ohmic reactions occur. The touch resistance should be as minimal as practicable, so that the resistance varies significantly due to the light impact. Lead and cadmium derivatives are toxic to the atmosphere and should be avoided.

The working theory of a light-based resistor is as follows:

Optical conductivity, which is nothing more than an optical illusion, is the basis for LDR action. When an entity consumes light, the material's conductivity reduces. As light illuminates the LDR, the electron in the valence strip of matter is forced into the transmitting strip. However, photons in incident light have more energy to move electrons from one band to another than the bandgap of matter (from valence to conduction).



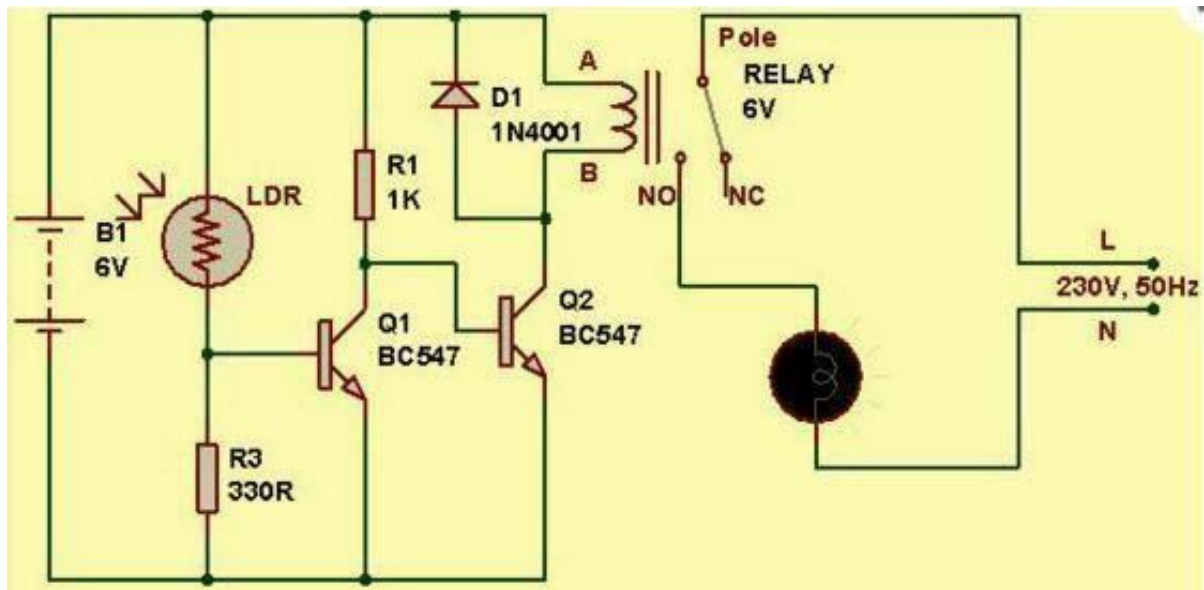
As a result, when light contains a lot of electricity, more electrons are excited in the conduction band, resulting in more charge carriers. As the current flow increases the resistance of the system decreases as the result of this mechanism becomes more apparent.

A circuit with a light-dependent resistor

The LDR circuit is an electrical circuit consisting of LDRs, relays, Darlington pairs, diodes and resistors, as shown in the circuit diagram below. Provided as a source of load voltage.

A bridge or a battery rectifier circuit supplies the DC voltage required for the LDR circuit. The AC power source is converted into a DC power source by this circuit. A step-down transformer is used in the bridge rectifier circuit to reduce the voltage from 230V to 12V. Diodes are connected to create a bridge that converts alternating current voltage into direct current. The voltage regulator converts 12 volts DC to 6 volts DC, which is then supplied to the entire circuit. A 230 V AC supply shall be maintained for both the bridge rectifier and load for the continuous operation of the light sensor circuit.

Light Dependent Resistor Circuit Diagram



This sensor is less than 100 resistor every morning. The energy flows through the LDR and the earth, as seen from the above light sensor circuit, through variable resistor and resistor. This is because the light-based resistance given during the day, or if the LDR is illuminated, is lower than the resistance of the rest of the sensor circuit. We've also heard of current theory, which says that current usually runs in the direction of opposition. As a consequence, the relay coil is unable to harden due to a lack of power. As a consequence, the sun sets earlier than normal throughout the day. Similarly, during the night, LDR resistance rises to a higher value (20 m). The current flow is minimal or near zero as a consequence of the resistor's high resistance. The current now flows through the lower resistance path, allowing the base voltage of the Darlington pair to exceed 1.4V. The relay coil receives sufficiently electricity to be energized while the Darlington transistor pair is energized, and the lamp is switched on at night.

Applications for LDR

Light-based resistors are low-cost and easy to use. These instruments are used in cases where detecting the existence and absence of light is important. Alarms, traffic signs, light strength meters, and anti-theft warning chains all utilize these resistors as optical sensors. We've added an example project: Energy saving for highly regulated street lights with LDR for a better understanding of this concept.

MCU ESP8266 4.3 NODE:

NodeMCU is a Lua-based open source production board and IoT-based applications-specific firmware. It includes firmware running on the ESP8266 Wi-Fi SoC of Espressif

Systems, and integrated hardware on the ESP-12 board.

Specifications and features of the NodeMCU ESP8266:

- 3.3V operating voltage
- Tensilicas 32-bit RISC CPU Xtensa LX106 microcontrollers
- SRAM: 4MB
- USB-TTL centred on CP2102 is supplied on the board, enabled plug in the game
- Digital I/O pins (DIO): 16
- Input tension: 7-12V
- UART: 1

4.7 NodeMCU ESP8266:

The ESP8266 chip is combined with the Tensilica Extensa 32-bit LX106 RISC microprocessor in the ESP-12E module on the NodeMCU ESP8266 development board. The RTOS is supported and the clock frequency is adjustable from 80MHz to 160MHz. NodeMCU has a flash memory of 128kb of RAM and 4MB to store data and applications. It is suitable for IoT ventures due to its high processing power, integrated Wi-Fi/Bluetooth and profound sleep operational settings.

A micro USB box and a Win PIN can be used to support NodeMCU (External Supply PIN). The interface includes UART, SPI and I2C.

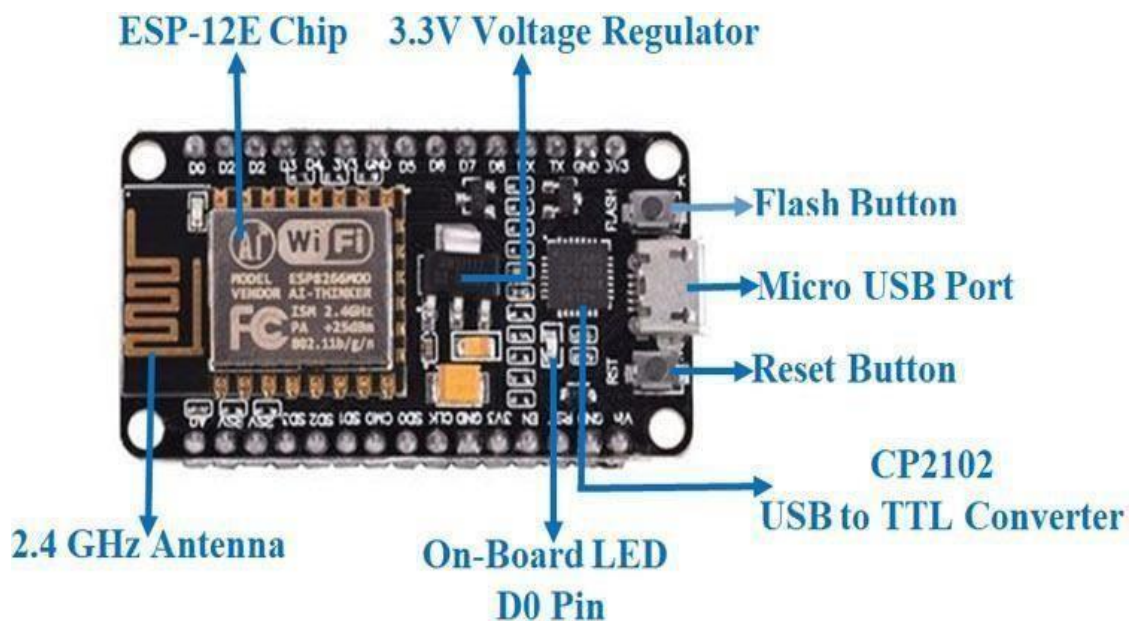


Fig 4.3 NodeMcu diagram

Power requirement:

Since the ESP8266 operating voltage range is between 3V and 3.6V, the board has an LDO voltage adjustment system, which keeps the voltage at 3.3V constant. He can keep going

When the ESP8266 is drawn up to 80mA during RF transmissions, supply

up to 600mA, which should be more than enough. The regulator is torn to one side of the performance board and also to its 3V3 number. Power can be supplied to the external parts through this screw.

The onboard Microbi USB connector powers the ESP8266 NodeMCU. You can use the VIN pin directly to power the ESP8266 and its accessories, if you have a controlled 5V supply.

The ESP8266 NodeMCU has a total of 17-pin GPIOs that are mounted on either side of the production board. These nails can be used for a variety of tasks, including:

- The 10-bit ADC channel is used on the ADC channel.

- UART Module - Used to upload UART interface code sequentially.

- W PWM outputs - PWM pins for controlling motors or dimming LEDs.

- SPI, I2C, and I2S - SPI and I2C interfaces are used to connect different types of sensors and peripherals.

- I2S Framework - If you want to include audio in your idea, you need an I2S interface.

The ESP8266 NodeMCU has 2 built-in switches and an LED indicator. The reset switch, known as the ESP8266 chip, is located at the top right corner. The update button is located on the bottom left corner to upgrade the firmware.

A user programmable LED is also included in the display and is connected to pin D0.

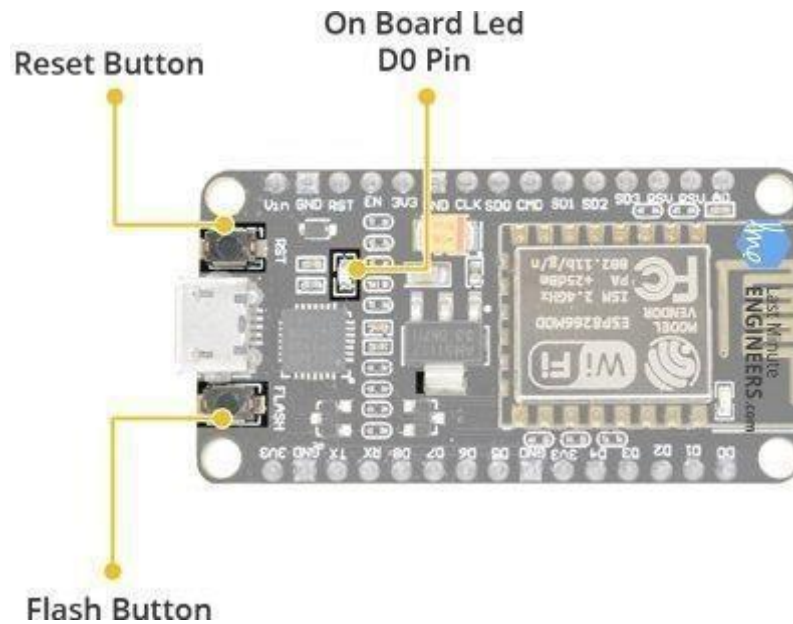


Fig 4.4 Switch diagram

Serial Communication:

The Silicon Labs CP2102 USB-to-UART Bridge Controller is included on the board, which converts USB signals serially and allows you to program and attach the ESP8266 chip from your computer.

**USB To TTL Converter
CP2102**

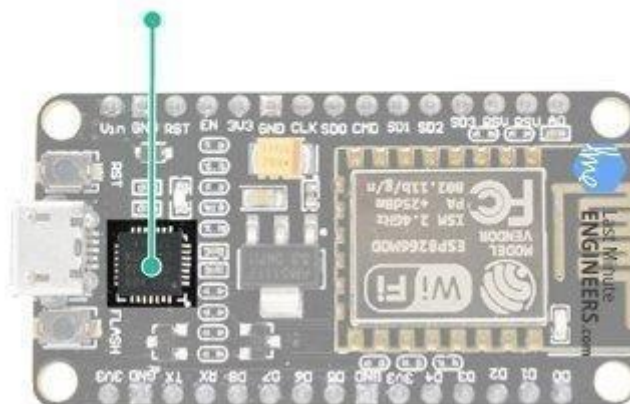


Fig 4.5 Serial communication diagram

If your device has an older version of the CP2102 driver, we recommend that you update it immediately.

ESP8266's Pinout NodeMCU: ESP8266 NodeMCU has a total of 30 pins

that connect to the rest of the planet. Below are the links:

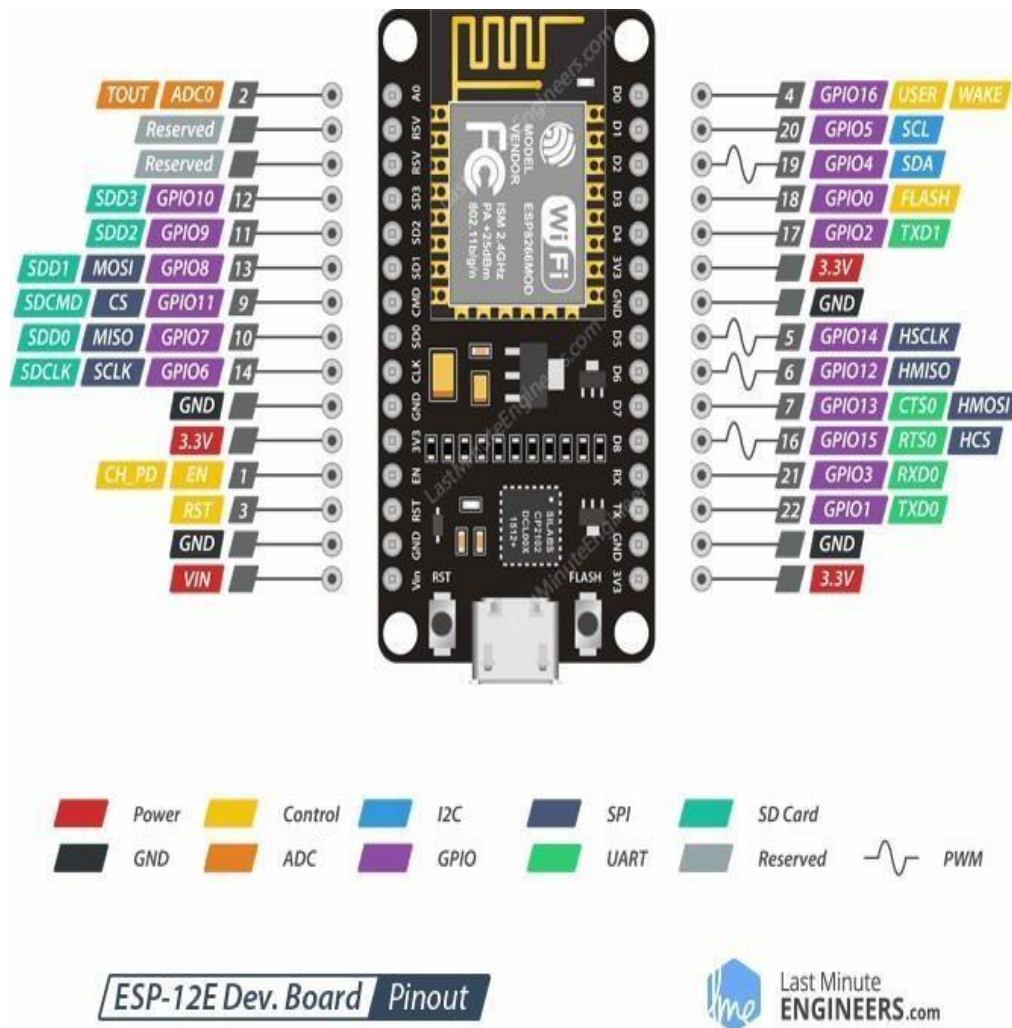


Fig 4.6 pinout diagram

To keep it easy, we'll group the pins with the same purpose together.

Power pins: The power pins are one VIN pin and three 3.3V pins. You will use the VIN pin to power the ESP8266 and its accessories directly if you have a regulated 5V supply. Surface voltage regulator output at 3.3 V pins.

These pins can be used to power controller external components.

GND: Ground Pin GND on the NodeMCU ESP8266 Production Board.

I2C pins: All I2C sensors and peripherals for your project are fitted with I2C pins. Also beneficial are the I2C Master and Slave. With a maximum clock frequency of 100kHz, the I2C protocol functionality can be applied programmatically. It is important to note that the frequency of the I2C clock should be higher than the frequency of the slower slave clock.

GPIO Pins: The NodeMCU ESP8266 has 17 GPIO pins which can be programmable to accomplish a variety of tasks such as I2C, I2S. Each GPIO can be programmed to high resistance with an internal or digital pull. It can even be set to the edge or level trigger to cause interruptions in the CPU if configured as data.

ADC Channel: A 10-bit SAR ADC is integrated in the NodeMCU. The VDD3P3 pin power supply tester and the TOUT pin voltage measurement can provide two functions that ADC can provide. However, it cannot be done simultaneously.

UART Pins: The ESP8266 NodeMCU has two UART interfaces, UART0 and UART1, that can link at up to 4.5Mbps and can communicate asynchronously (RS232 and RS485). UART0 (Universal Asynchronous Transfer Mode) is a form of asynchronous transfer mode (TXD0, RXD0, RST0 and CTS0 pins)

It may be used to communicate. Fluid management is made easier as a result of this. UART1 (TXD1 PIN) is widely used to print documents and it only transmits records.

SPI Pins: The ESP8266 has two SPIs (SPI and HSPI), both of which can be

used as a slave or owner.

The following general-purpose SPI functions are also assisted by these SPIs:

There are four timing modes on an SPI format transfer.

M 80 MHz clocks split into 64 64 bytes M 80 MHz clocks split into M 80 MHz clocks split into M 80 MHz clocks split into M 80 FIFO (First In, First Out) is a

SDIO Pins: The ESP8266 has an SDIO (secure digital I/O) interface that can be used to directly attach SD cards. SDIO v1.1 (four-bit 25MHz) and SDIO v2.0 (four-bit 50MHz) are also supported.

PWM (Pulse Width Modulation) Pins: There are four PWM (PWM) channels on the frame. Digital motors and LEDs can be driven with PWM output that can be configured. Between 1000 and 10,000 seconds, or 100Hz and 1kHz, the PWM frequency range may be modified.

Control pins: To operate the ESP8266, control pins are used. Among those pins are the chip-activated pin (EN), the reset pin (RST) and the wake pin. When the EN pin is pulled too far, the ESP8266 chip is activated. The chip is fuel-efficient as little as possible while the volume is low.

RST PIN – To set up the ESP8266 chip, use RST PIN.

- **Wake up Shuttle** - This pin is used to wake slumber up the slide.

4.8 water flow motor

Water pumps do just as their name implies: they pipe water into the system.

Customers typically find a water pump to suit their vehicle or to assist them in bringing water from the farm to a self-drilled well, which can then be used in pressure tanks in the region, whether in a car, store, house, or well. The water pumps in your car regulate the flow of water during the cooling process; if one of them fails, the pump must be fully replaced. Water

pressure is maintained during the year and the water flow to various parts of the building is monitored by pressure controlled water pumps, which are typically located within the house or company.

The motor fluids are driven by the engine, which is a continuous current drive. A DC motor transforms direct current electrical energy into mechanical energy. A current-carrying conductor detects torque and starts to shift as it is put in a magnetic field. A DC or DC engine operates in the same way. This is referred to as "motor movement."

Pumps are guided by motion and utilize force to conduct mechanical function by conveying fluids. Pumps may be driven by manual operation, electricity, batteries, or wind power, among other options. They can range in scale from microscopic pumps to massive industrial pumps for medical applications.

Characteristics of water pump motors

Noise reduction reduction

Both DC and AC models are available.

+ 12VDC (supply voltage)

230 VAC is the supply voltage.

Submissions are welcome.

Pump priming

Pumping water, including pneumatic systems, in places where suction lift isn't required.

a body of water Use the pump as a daily supply of power.

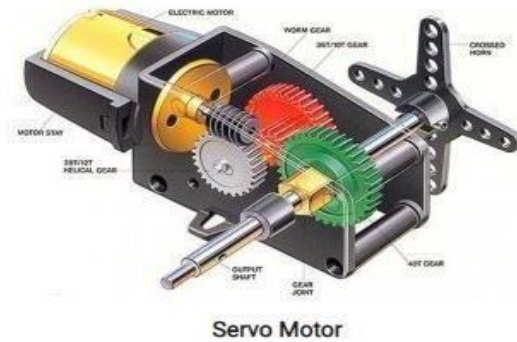
In the home water supply system, there is water.

Fish may be prepared in a variety of ways.

The servo motor is a linear or revolving actuator on which one may depend.

A one-of-a-kind system made specially for servo motors.

Robots, CNC machines, and fish feed systems all utilize servo motors..



MECHANISM

The servo motor is a closed loop servo system that regulates its direction and end position by using location input. The signal (analog or digital) that is fed indicates the intended position of the output shaft.

An encoder is attached to the motor to provide location and speed input. Only the base case is used to evaluate the trend. The determined performance location is related to the command position, which corresponds to the console's external remarks. An error signal is sent if the output location does not fit the correct position, Forcing the engine to pull in either direction, forcing the output shaft in the right position. When the places hit zero and the motor dies, the incorrect signal disappears.

A voltmeter is used to feel location and power the motor in simple servo motors; the engine is either operating (or stopped) at maximum speed. Although this kind of servo motor isn't often used in industrial motion management, it's the foundation for the simple and low-cost servos used in radio-controlled models.

Advanced servo motors utilize optical rotary encoders [2] and variable speed drives to control motor speed and measure production shaft speeds.

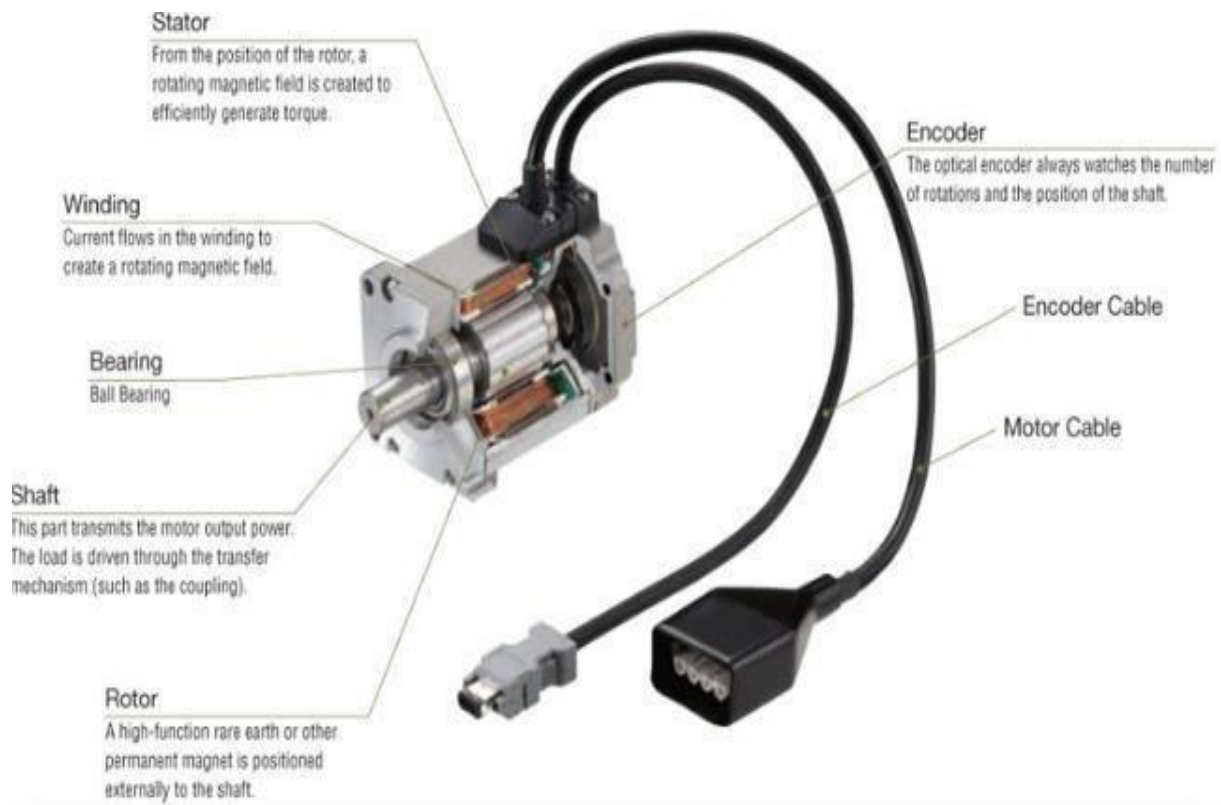
[Third]

These two enhancements, when coupled with the PID control algorithm, allow the servo motor to hit its regulated location faster and more precisely, with less bypassing.

The common DC motor, the gear reduction unit, the location sensor, and the control circuit make up the servo motor. The gear mechanism is connected to a DC motor and provides feedback to a location sensor, which is usually a voltmeter. The gearbox's servo bracket transmits the motor's output to the servo lever. The gear on standard servo motors is normally rubber, while the gear on high-power machines is typically metal.

The servo motor has three wires: one black wire to earth, one white/yellow wire to the controller, and one red wire to the power supply.

SERVO MOTOR



The servo motor's job is to take the control signal corresponding to the desired direction of the servo shaft output and operate its DC motor until the shaft moves.

The location sensor device determines the shaft's rotational direction, allowing the motor to calculate the shaft's rotational direction and rotate the shaft to the desired point. Since it is difficult to spin the shaft around an axis like a DC engine, it can only rotate 200 degrees.

What is the best way to operate a servo motor?

The location of the servo motor is monitored using pulse width modulation technology. The actuator's pulse width is adjustable and is delivered for a set

amount of time.

The pulse frequency determines the servo motor's angular direction. An angle mode of 0 degrees is produced by a pulse width of 1 milliseconds, while an angle mode of 180 degrees is produced by a pulse width of 2 milliseconds.

Advantages:

a vehicle The driver may attempt to rotate the motor that sends current to the motor winding after it has been subjected to a heavy load. No such thing as touch exists.

It is possible to operate at very high speeds.

Servo motors are used in a wide range of shapes and sizes.

The servo engines are known as AC Servo Engines, DC Servo Motors, brushless DC servo Engines, Spot Rotations, continuous rotation and linear Servo Engines. Three wires are used in a standard servo motor: energy balance, ground and control. The planned usage determines the form and scale of these motors. Because RC servo engines are simple, affordable and resilient, they are servo engines used in hobby and robot applications.

Servo Motor is a form of motor that is used to control (DC)

Typically in the winding and winding sector the DC servo motor has a separate DC source. To archive control, you may use motor current or field current control. It has aspects of field tracking in it.

There are many different benefits to engine control. Similarly, there are some advantages to engine control over field control. The DC servo motor must be controlled according to the applications. Thanks to the low inductive reaction of the case, DC servo motors have a very precise and fast response to start or stop demand signals. DC servo motors use digitally similar devices and equipment powered by a computer.



DC Servo Motor

AC Servo Motor

The encoder on an AC servo motor is used in conjunction with controllers to provide closed loop power and input. This motor can be precisely positioned and controlled as specified by the applications. Although some simple models use larger torques by higher voltages, these engines are either equipped with higher strength systems or stronger coils. The alternative current motor is one of the most popular applications in automation, robotic engines, CNC machines and other applications which are highly precise and versatile.



AC Servo Motor

Positional Rotation Servo Motor

The place servo motor is the most popular kind of servo motor. The shaft rotates approximately 180 degrees clockwise and counterclockwise. To prevent the gyro sensor from turning outside of these limits, physical stops are necessary in the gear system. Radio-controlled water, remote-controlled vessels, airplanes, robotics, toys, and a variety of other uses for machinery are all possible.

Continuous rotation servo motor

In the same way as place rotating servo motors will move in either direction at any moment, continuous rotating servo motors can as well. Instead of changing the static servor direction, the control signal is defined as speed and direction of rotation. The servo is activated by several possible commands at different speeds, depending on the dial signal, in the direction or counterclockwise. If you are running a radar robot, or if you can be used as a drive engine in the handheld robot, this type of drive is used.



Continuous Rotation Servo Motor

Linear Servo Motor

Similar to positional rotary servo motors, linear servo motors have an extra gear to shift the o/p from circular to round-trip. These servo motors are difficult to come by, although they are sometimes available in hobby shops for use as drives on larger aircraft types.



Linear Servo Motor

Servo Motor Working

In controlling robotics and control applications, a new servo motor architecture has been proposed. These are used for high speed power adjustment.

Torque and precise positioning are two things that come to mind when thinking about torque. Highly designed motor position sensor and controller important components A servo motor driven by a servo mechanism can be used to classify these motors. This is called a servo engine when a DC engine is driven in this way. Servomotor power ratings range between a fraction of a watt and 100 Watts. The servo motor has low rotor length and small diameter inertia. Please see the following introduction for more information: Servo Motor Working Theory and 8051 Microcontroller Interaction



SOFTWARE REQUIREMENTS DETAILS

4.9 EMBEDDED C:

Embedded C is the most widely used programming language to design electronic devices in the electronics industry. The included software is connected to each device in the electronic device.

Embedded C programming is important for the processor to perform complex tasks. We use many technological gadgets in our daily lives such as cell phones, washing machines, portable cameras and so on. Both systems operate on a microcontroller programmed into C.

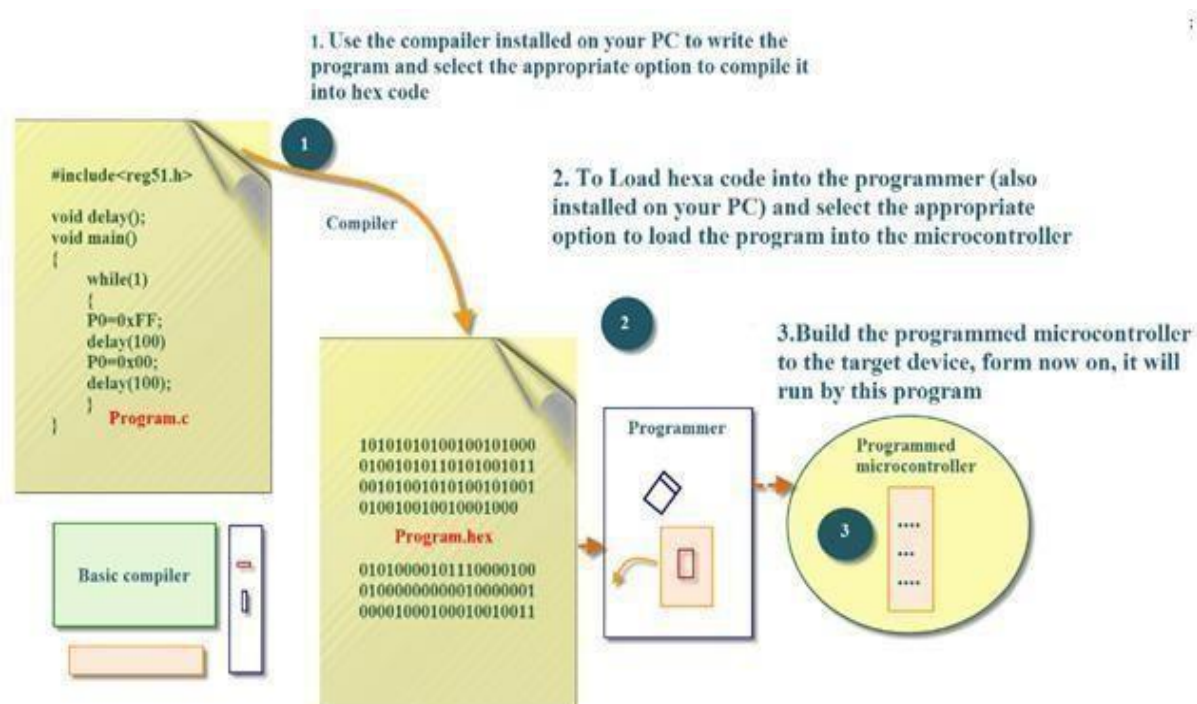


Fig 4.7 Block diagram of Embedded C

The C symbol included in the upper block diagram is used to dim the LED connected to the microcontroller port 0.

C programming code is preferred over other languages in embedded systems. Due to the following factors:

Understand is easy to understand • high reliability • portability • scalability

A programming language is a set of one or more functions. An approach is a collection of phrases used to perform a specific operation.

Users are also increasingly interested in application software, which offers functionality on a smartphone. Embedded hardware, on the other side, is more complex but less simple. In comparison to application applications, included software specifies hardware functionality and characteristics and is tightly regulated by third-party hardware or software.

The included applications must provide both device drivers and hardware drivers written explicitly for the hardware. Specialized chipsets were chosen because the software is highly reliant on the CPU. To test the use of the recording and contact system, most embedded software engineers have a limited understanding of reading diagrams and component datasheets. Bit editing and binary, hexadecimal, and decimal conversions are helpful.

Web technologies are seldom used, despite the fact that XML files and other output may be forwarded to the browser for viewing. There are usually no SQL files or file systems of folders.

Cross compiler produces executable code for the target platform when running on the computer. It is necessary to make corrections.

Use the JTAG or SWD emulator within the circuit. Software engineers often have access to the source code of the kernel (OS).

The amount of usable disk and RAM differs greatly. Others contend with mainstream machines which have 16 KB of flash, 4 KB of RAM, and an 8MHz Processor. [Nine] The most of the analysis is performed in C ++ rather than C or C ++ due to space restrictions. Languages such as Simple (can be compiled with

parallax propeller basic) and Java (Java ME embedded 8.3[9]), used for older ARM Cortex-M4, Cortex-M7, and ARM11 controllers used in the Raspberry Pi and Intel Galileo genres, are not widely used. large; However, Micropython, a Python 3 language implementation, is only available for microcontrollers.

The importance of connectivity between processors and other components cannot be overstated. Normal interfaces for direct memory processing include I2C, SPI, serial, and USB ports.

Closed source networking protocols for embedded systems are provided by companies such as Internet Technologies and CMX Solutions. uIP, lwip, and other open source protocols are examples.

- Using C, this software demonstrates how to use structure inside structure. variable. “student_college_detail” structure is declared inside
- In this curriculum, there is a framework called "student detail." Both structure variables are essential. Members of the "student college detail" framework are accessed using the two dots (.) operator, while members of the "student" structure are standard structure variables.
- A single dot(.) operator is used to enter the _detail” layout.

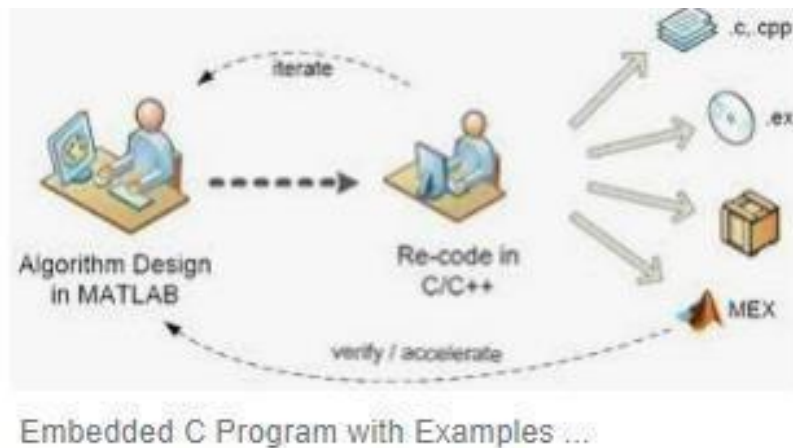


Fig 4.8 Embedded C program with examples

A compiler keyword is a concept with a particular meaning (C compiler, for example, a program used to convert a program written in C language into machine code). Consider Kyle's Cx51 compiler (a common C compiler for microcontrollers based on the 8051), which includes the following keywords:

a sbit a sbit a sbit a sbit a sbit a sbit a sbit a sbit a sbit a sbit a sbit a s

These are only a few of the common multiple keywords associated with the Cx51 C compiler, in addition to the standard C keywords.

4.4: ARDUINO IDE:

Arduino is a platform for building electronic businesses that is open and free. Arduino contains an integrated development environment programming board which works with your laptop to write down or upload the programming code into your physics board and a physical board programming board. This programming board is also known as a microcontroller.

The Arduino platform electronics has grown in popularity among the general population for good reasons. Arduino, unlike previous programmable circuit boards, does not need special hardware (called programmers) to load new programming onto the board; all you need is a

USB cable. Furthermore, the Arduino IDE simplifies programming by using a capacitive C++ variant. Finally, Arduino implements a standardized form factor that divides microcontroller functions into a more manageable collection.

Arduino's hardware and software will help artists, programmers, fans, hackers, beginners, and anybody interested with making things or immersive environments. Buttons, LEDs, engines, speakers, GPS devices, displays, cars, and even your smartphone or TV can all be regulated by Arduino. Arduino software is open, hardware boards are cheap, both software and hardware are simple to understand, and a vast number of users have submitted code and post guidance for a broad variety of Arduino-based projects because of this simplicity.

There are a variety of Arduino boards available that can be used for a variety of purposes (shown on the next page). Any of the boards vary from the ones seen below, but the majority of the pieces are the same in both orders.



Fig 4.9 Arduino IDE Diagram

Figures Arduino Software Developed Programs (IDE). These graphics were made in a text editor and stored as .ino files. Cut / Paste and Search / Replace Code Editor are also accessible. When saving and exporting, the message region shows errors and offers input. The Arduino Software (IDE) feeds the computer document, including full error messages and other details. The designer panel and serial port are visible in the window's lower right corner. The toolbar buttons can be used to search and import programs, build, display, and save graphics, and open a serial monitor.

Despite its simplicity, the Arduino IDE offers a nearly full environment for most Arduino-based ventures. "File" (new, downloading, saving, and so on), "Edit" (Lines, Duplicate, Paste, and so on), "Draw" (for translation and programming), "Tools" (useful choices for verification), and "Help" (in the top menu bar) are all popular options. The plain text editor is located in the center of the IDE, and it is where you can write to your software file. The output window at the bottom of the IDE displays the collection's state, the amount of memory utilized, any software bugs, and a variety of other help messages.

Diagrams are Arduino projects written in an abbreviated form of C ++ (the majority of C ++ features are not included). Since the programming of

microcontrollers differs from computer programmes, several device libraries exist (for example, changing pin modes, output data on pins, reading analogue values, and timers). Users who think Arduino is encrypted in "arduino language" might be upset. Arduino, on the other hand, is written in the C++ programming language. For the computer, it makes use of repositories.

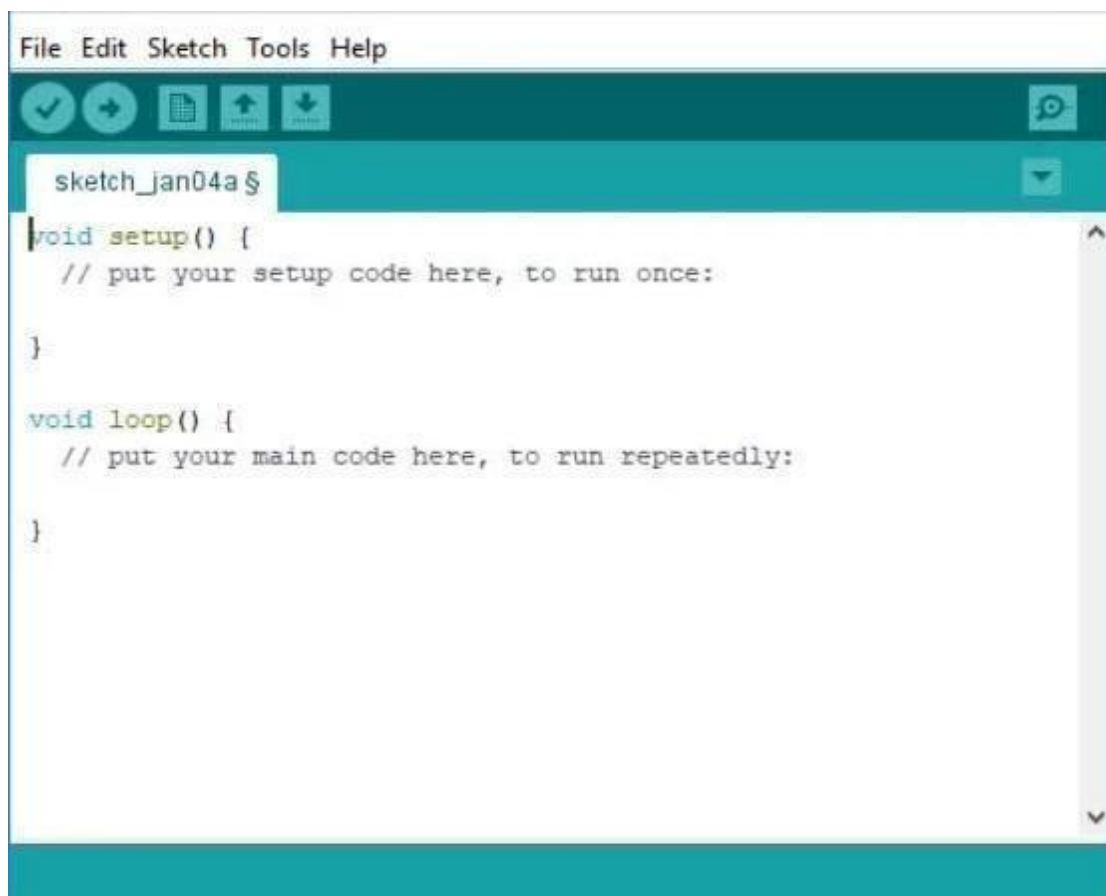


Fig 4.10 Arduino IDE Software diagram

To aid C and C++ languages, the Arduino IDE employs special code structure laws. A program library integrated into the Arduino IDE offers several basic input and output routines, which is included in the wiring project. User-written programming necessitates the use of two basic functions: one to begin drawing and the other to run the key program loop, which is compiled and combined with the rest of the program.

Install the stub key () into the Periodic Executable Program for the GNU Toolbar,

which is also used in the IDE distribution. The text file is translated into hex encoding by Arduino's IDE Award software, and is then inserted into the Arduino board's firmware by the loaded program.

CHAPTER 5

RESULT AND PERFORMANCE ANALYSIS

Many of the Arduino Uno's sensors have been embedded into smartphones and computers. The Arduino Uno microcontroller and sensors are designed to receive changes in environmental variables such as fire, illumination, humidity, and other variables related to the system, and are used to create a transceiver circuit, an ADC switch, a GSM module, a PIR sensor, an LM35 temperature sensor, and a SIM card. With data on farm prices. Figure 5.2 shows a contribution from the Cloud IoT website. This instrument determines temperature, humidity, and pH levels.

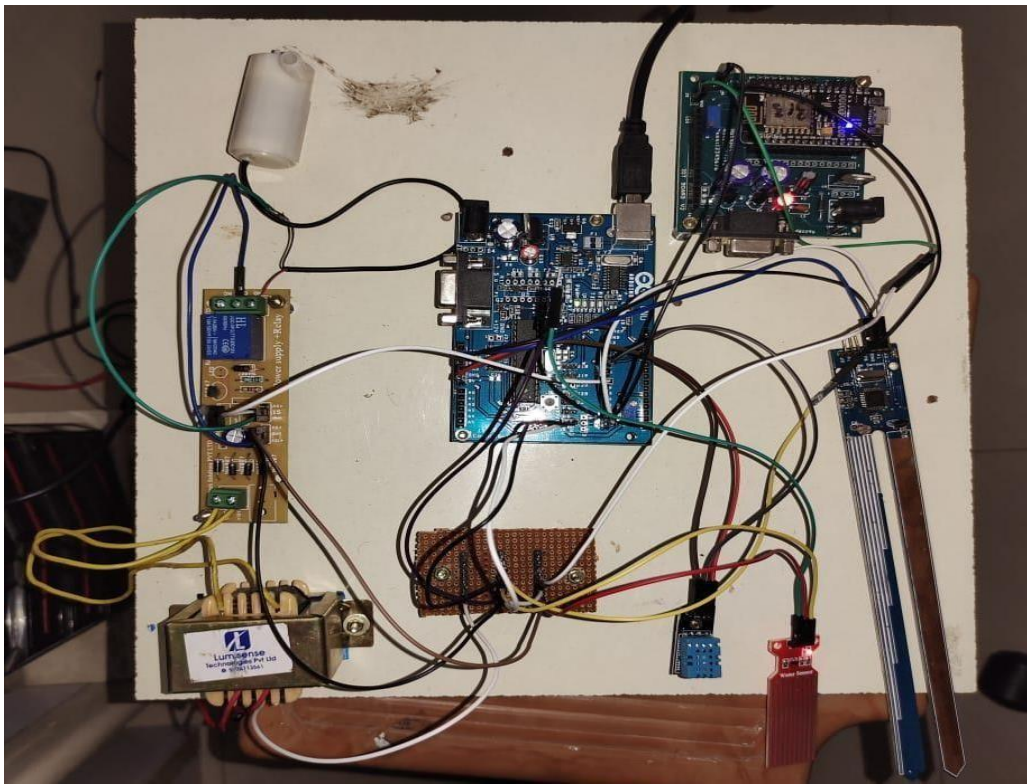


Fig 5.1 FINAL DEVELOPED MODEL

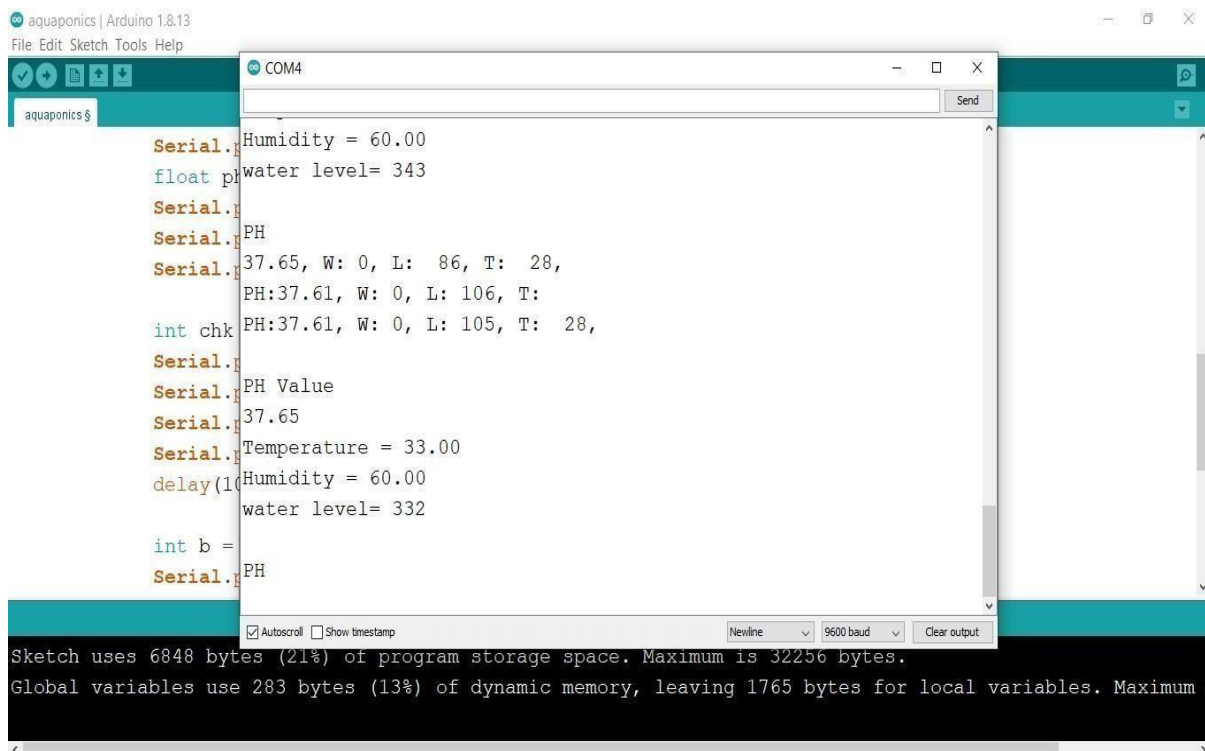


Fig 5.2 FINAL OUTPUT

CHAPTER 6

CONCLUSION

Since the project is a prototype, it was created with certain constraints in a short amount of time. It may be extended by extending the structure to cover a wider environment, including open areas, restaurants, building halls, ceilings, classrooms, and other spaces. This paper describes a web-based smart control system that can be used to encourage and improve agriculture, step toward self-sufficiency, provide high-quality sewage, collect environmental data for smart farms through sensors, and submit data to farms and workers. App for mobile devices. Here you'll find easy-to-understand mobile services. Consumer productivity and production are increased since the consumer will observe the seed growth cycle from beginning to end before harvesting and sale in the online agricultural production process. Environmental management and control system elements, as well as potential modifications, would be discussed and tested in a variety of forms, including the test assessment. New technology, low-cost smart farming, modular solutions, direct output control, and farms are required to satisfy the increasing demand for food in the developing global economy, which is largely based on agriculture. This action has been identified as a significant route for field operations, irrigation problems, and water management in both scientific and experimental testing. The usage of such machinery in this area would certainly aid crop care, people's welfare, self-sufficiency, small and small animals, and land-based agriculture. Spaceships and space stations are two types of spacecraft.

The aquaculture scheme with IoT-assisted monitoring was researched and implemented in Taiwanese urban conditions and nutritional needs in this article. We based on the proportion of fish plants in this experiment and then measured whether recycling water would bring fish and plants into equilibrium. Since this ratio differs with various fish and plant types, we use IoT technology to collect all experimental results. In the future, we'll try and locate and analyze this info, and then create a smart computer to simplify the Internet of Things.

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