

IOT BASED DISASTER MONITORING AND MANAGEMENT SYSTEM FOR DAMS

A Project Report Phase – II

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

by

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **UPPALAPATTI SAI SUBRHMANYA SRINIVAS (39130488)** and **UDDAGIRI SIVA KIRAN (39130485)** who carried out the project entitled **"IOT BASED DISASTER MONITORING AND MANAGEMENT SYSTEM FOR DAMS "** under my supervision from November 2022 to April 2023.

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ABSTRACT

Dams are of major importance, primarily because of their use for generating hydroelectricity and irrigation purposes. This has resulted in the construction of a number of dams in potential areas over the years. As there are a lot of risk factors associated with the existence of these dams, it has become the need of the hour to develop a proper monitoring and management system for maintaining a safe water level in dams. Mismanagement of dams can lead to manmade disasters. Currently dams in our state are being monitored and controlled manually. This manual intervention can increase the probability of error and also results in time lag in decision making. The aim of this project is to design and implement an IoT based Disaster Monitoring and Management System for Dams (IDMMSD). The proposed system involves real-time monitoring of water levels of a group of dams under study. Water levels may vary due to drastic changes in water levels of connected rivers or lakes, or due to excessive rainfall in the catchment area. The proposed project includes a mechatronics system to open the shutters at the heights pre-calculated. The system comprises of sensor nodes, smart controller and communication system. The proposed system is an app based IoT system which will monitor and send real time parameters related to Dam (gate position, water discharge, water level) and weather conditions. There will be two modes for operating the software i.e. Autopilot mode and Manual data mode. The system also includes features like SMS alert to the people of the locality to rescue operations in case of adverse weather conditions.

The project proposes “IoT based Disaster Monitoring and Management System” Dams by integrating IoT devices, including water level sensor, Arduino and other complementary equipment. The idea of this research paper is the smart IoT system will collect all real time parameters and weather conditions all around the dam. The sensors will be all over the dam and connected to the Arduino that are responsible for collecting the data and send to the Arduino. Then the Wi-Fi module will transform the data to the cloud service and then will show in app for the employee in the dam. If there are any readings indicating a flood, the system will send to the residents near the dam.

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CHAPTER – 1

INTRODUCTION

1.1 INTRODUCTION :

In 2018, Kerala has experienced the largest disaster due to flood after 1924. The continuous rain for first week of August'18, accumulated huge rain water in several dams. Consequently, on 10th August 2018, 35 dams were opened by KSEB. Water discharged from these 35 dams in addition to the excessive rain water created deluge and natural disasters in a number of districts of the state. The development of this system requires collecting information of the existing dam facilities, establishment of a robust communication network (between sensors and controllers) and development of a mechatronics system for shutter control. The complexity of the system increases in considering extreme weather conditions, such as droughts and floods. Literature is rich with researches on water level monitoring systems for various applications; using wireless networks, IoT based systems for water tank monitoring, Water quality monitoring, water level monitoring system and water level control system in steam generator for nuclear power plants. An automated dam for irrigation is presented in.

In this work of disaster monitoring and management system for dams that continuously monitors the water level of the dam and also estimates the water inflow rate to the dam (considering various sensor measurements). It controls the movement of gates using IoT on a real-time basis. The Internet of Things (IoT) is a system in which various physical objects are interconnected through web. The proposed system includes features like SOS alarms for police, fire force, disaster management team, emergency team, and SMS alerts for common people who lives near the dam and flood prone areas in case of any foreseen disaster. The SMS alert facility helps common people to evacuate to safe locations. IoT in disaster management can help us in predicting calamities, alerting authorities at an early stage, and rescuing people affected by disasters, thus potentially saving lives, money, and resources. IoT devices hold the power to transform the reactive disaster management techniques into predictive ones.

Hence an effective dam monitoring system with monitoring screen and a gate control function built onto a mobile application will allow the user to monitor the level of water on a real time basis along with other vital parameters, for better disaster mitigation and water management using water level monitoring, Live weather status, risk reduction using alert system and dam gate control. The proposed system should leave its users in control of the gate. Several dams and major water bodies can be monitored and synchronized based on the data's retrieved and early warning systems can be integrated. Precise decisions can be taken well in hand thus averting the last-minute rush. The exclusive control and operation of the dam is restricted for the dam operator whereas the alerts and few major monitoring parameter.

1.2 INTRODUCTION OF IOT :

The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. Thanks to the advent of inexpensive computer chips and high bandwidth telecommunication, we now have billions of devices connected to the internet. This means everyday devices like toothbrushes, vacuums, cars, and machines can use sensors to collect data and respond intelligently to users.

The Internet of Things integrates everyday “things” with the internet. Computer Engineers have been adding sensors and processors to everyday objects since the 90s. However, progress was initially slow because the chips were big and bulky. Low power computer chips called RFID tags were first used to track expensive equipment. As computing devices shrank in size, these chips also became smaller, faster, and smarter over time. The cost of integrating computing power into small objects has now dropped considerably. For example, you can add connectivity with Alexa voice services capabilities to MCUs with less than 1MB embedded RAM, such as for light switches. A whole industry has sprung up with a focus on filling our homes, businesses, and offices with IoT devices.

A. Data Storage

A challenge for producers of IoT applications is to clean, process and interpret the vast amount of data which is gathered by the sensors. There is a solution proposed for the analytics of the information referred to as Wireless Sensor Networks. These networks share data among sensor nodes that are sent to a distributed system for the analytics of the sensory data. Another challenge is the storage of this bulk data. Depending on the application, there could be high data acquisition requirements, which in turn lead to high storage requirements. Currently the Internet is already responsible for 5% of the total energy generated, and a "daunting challenge to power" IoT devices to collect and even store data still remains.

Data silos, although a common challenge of legacy systems, still commonly occur with the implementation of IoT devices, particularly within manufacturing. As there are a lot of benefits to be gained from IoT and IoT devices, the means in which the data is stored can present serious challenges without the principles of autonomy, transparency, and interoperability being considered. The challenges do not occur by the device itself, but the means in which databases and warehouses are set-up. These challenges were commonly identified in manufactures and enterprises which have begun upon digital transformation, and are part of the digital foundation, indicating that in order to receive the optimal benefits from IoT devices and for decision making, enterprises will have to first re-align their data storing methods. These challenges were identified by Keller (2021) when investigating the IT and application landscape of I4.0 implementation within German M&E manufactures.

B. Security

Security is the biggest concern in adopting Internet of things technology, with concerns that rapid development is happening without appropriate consideration of the profound security challenges involved and the regulatory changes that might be necessary. The rapid development of the Internet of Things (IoT) has allowed billions of devices to connect to the network. Due to too many connected devices and the limitation of communication security technology, various security issues gradually appear in the IoT.

Most of the technical security concerns are similar to those of conventional servers, workstations and smart phones. These concerns include using weak authentication, forgetting to change default credentials, unencrypted messages sent between devices, SQL injections, Man-in-the-middle attacks, and poor handling of security updates. However, many IoT devices have severe operational limitations on the computational power available to them. These constraints often make them unable to directly use basic security measures such as implementing firewalls or using strong cryptosystems to encrypt their communications with other devices - and the low price and consumer focus of many devices makes a robust security patching system uncommon.

Rather than conventional security vulnerabilities, fault injection attacks are on the rise and targeting IoT devices. A fault injection attack is a physical attack on a device to purposefully introduce faults in the system to change the intended behavior. Faults might happen unintentionally by environmental noises and electromagnetic fields. There are ideas stemmed from control-flow integrity (CFI) to prevent fault injection attacks and system recovery to a healthy state before the fault.

Internet of things devices also have access to new areas of data, and can often control physical devices, so that even by 2014 it was possible to say that many Internet-connected appliances could already "spy on people in their own homes" including televisions, kitchen appliances, cameras, and thermostats. Computer-controlled devices in automobiles such as brakes, engine, locks, hood and trunk releases, horn, heat, and dashboard have been shown to be vulnerable to attackers who have access to the on-board network. In some cases, vehicle computer systems are Internet-connected, allowing them to be exploited remotely. By 2008 security researchers had shown the ability to remotely control pacemakers without authority. Later hackers demonstrated remote control of insulin pumps and implantable cardioverter defibrillators. Poorly secured Internet-accessible IoT devices can also be subverted to attack others. In 2016, a distributed denial of service attack powered by Internet of things devices running the Mirai malware took down a DNS provider and major web sites.

The Mirai Botnet had infected roughly 65,000 IoT devices within the first 20 hours. Eventually the infections increased to around 200,000 to 300,000 infections. Brazil, Colombia and Vietnam made up of 41.5% of the infections. The Mirai Botnet had singled out specific IoT devices that consisted of DVRs, IP cameras, routers and printers. Top vendors that contained the most infected devices were identified as Dahua, Huawei, ZTE, Cisco, ZyXEL and MikroTik. May 2017, Junade Ali, a Computer Scientist at Cloudflare noted that native DDoS vulnerabilities exist in IoT devices due to a poor implementation of the Publish-subscribe pattern. These sorts of attacks have caused security experts to view IoT as a real threat to Internet services.

The U.S. National Intelligence Council in an unclassified report maintains that it would be hard to deny "access to networks of sensors and remotely-controlled objects by enemies of the United States, criminals, and mischief makers... An open market for aggregated sensor data could serve the interests of commerce and security no less than it helps criminals and spies identify vulnerable targets. Thus, massively parallel sensor fusion may undermine social cohesion, if it proves to be fundamentally incompatible with Fourth-Amendment guarantees against unreasonable search." In general, the intelligence community views the Internet of things as a rich source of data. On 31 January 2019, the Washington Post wrote an article regarding the security and ethical challenges that can occur with IoT doorbells and cameras: "Last month, Ring got caught allowing its team in Ukraine to view and annotate certain user videos; the company says it only looks at publicly shared videos and those from Ring owners who provide consent. Just last week, a California family's Nest camera let a hacker take over and broadcast fake audio warnings about a missile attack, not to mention peer in on them, when they used a weak password"

There have been a range of responses to concerns over security. The Internet of Things Security Foundation (IoTSF) was launched on 23 September 2015 with a mission to secure the Internet of things by promoting knowledge and best practice. Its founding board is made from technology providers and telecommunications companies. In addition, large IT companies are continually developing innovative solutions to ensure the security of IoT devices.

In 2017, Mozilla launched Project Things, which allows to route IoT devices through a safe Web of Things gateway. As per the estimates from KBV Research, the overall IoT security market would grow at 27.9% rate during 2016–2022 as a result of growing infrastructural concerns and diversified usage of Internet of things. Governmental regulation is argued by some to be necessary to secure IoT devices and the wider Internet – as market incentives to secure IoT devices is insufficient. It was found that due to the nature of most of the IoT development boards, they generate predictable and weak keys which make it easy to be utilized by Man-in-the-middle attack. However, various hardening approaches were proposed by many researchers to resolve the issue of SSH weak implementation and weak keys.

IoT security within the field of manufacturing presents different challenges, and varying perspectives. Within the EU and Germany, data protection is constantly referenced throughout manufacturing and digital policy particularly that of I4.0. However, the attitude towards data security differs from the enterprise perspective where as there is an emphasis on less data protection in the form of GDPR as the data being collected from IoT devices in the manufacturing sector does not display personal details. Yet, research has indicated that manufacturing experts are concerned about "data security for protecting machine technology from international competitors with the ever-greater push for interconnectivity".

C. Safety

IoT systems are typically controlled by event-driven smart apps that take as input either sensed data, user inputs, or other external triggers (from the Internet) and command one or more actuators towards providing different forms of automation. Examples of sensors include smoke detectors, motion sensors, and contact sensors. Examples of actuators include smart locks, smart power outlets, and door controls. Popular control platforms on which third-party developers can build smart apps that interact wirelessly with these sensors and actuators include Samsung's SmartThings, Apple's HomeKit, and Amazon's Alexa, among others.

1.3 CLOUD COMPUTING :

Cloud Computing is the delivery of computing services such as servers, storage, databases, networking, software, analytics, intelligence, and more, over the Cloud (Internet).

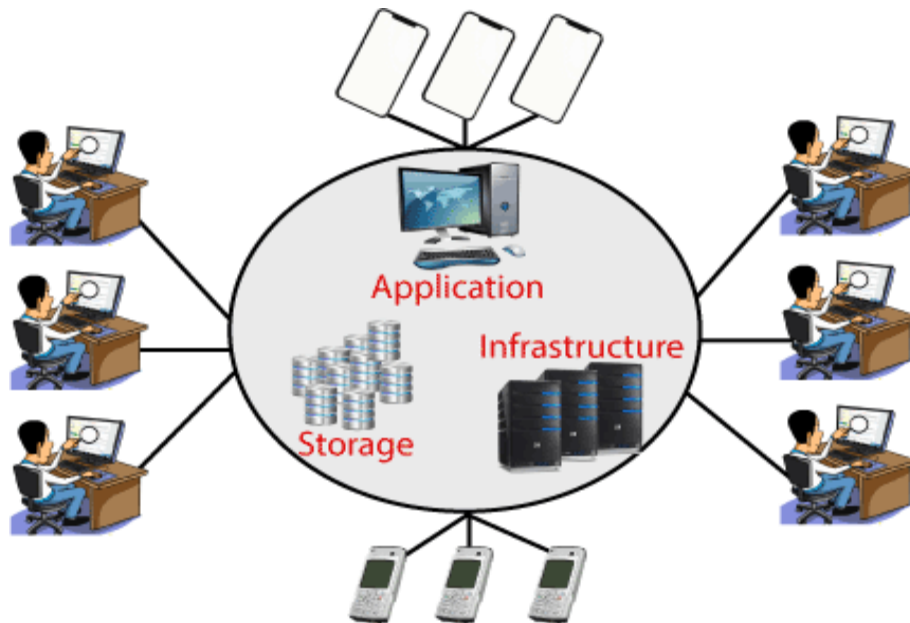


FIG 1.1 Cloud Platform

Cloud Computing provides an alternative to the on-premises data center. With an on-premises data center, we have to manage everything, such as purchasing and installing hardware, virtualization, installing the operating system, and any other required applications, setting up the network, configuring the firewall, and setting up storage for data. After doing all the set-up, we become responsible for maintaining it through its entire lifecycle.

But choose Cloud Computing, a cloud vendor is responsible for the hardware purchase and maintenance. They also provide a wide variety of software and platform as a service. We can take any required services on rent. The cloud computing services will be charged based on usage.

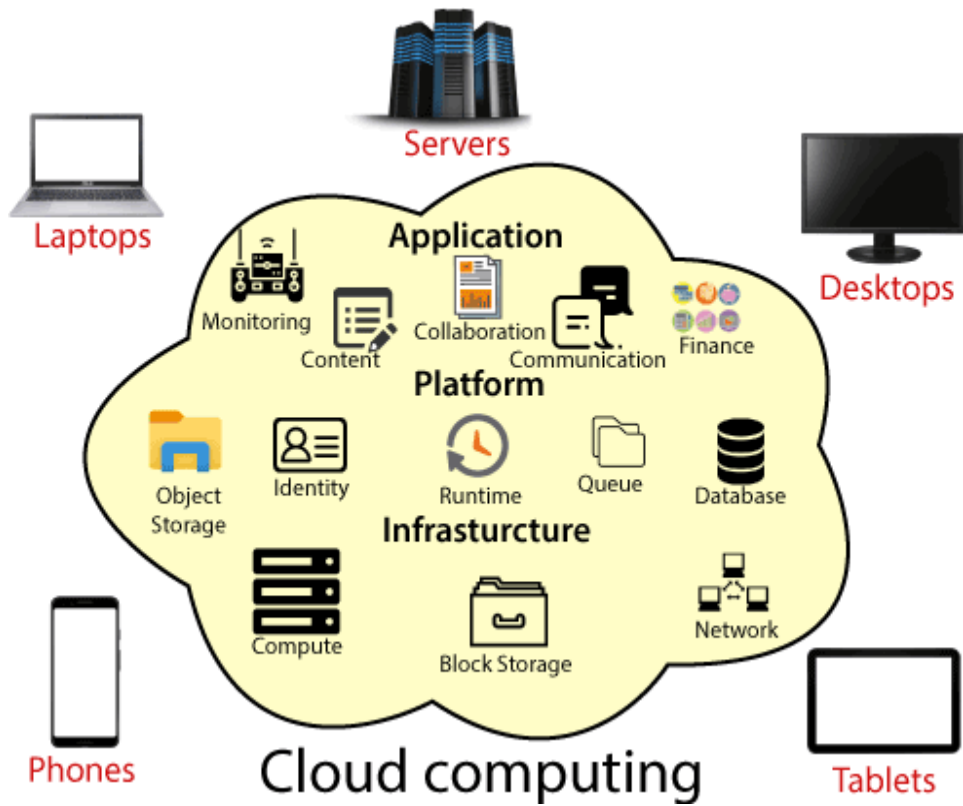


FIG 1.2 Cloud Infrastructure

The cloud environment provides an easily accessible online portal that makes handy for the user to manage the compute, storage, network, and application resources. Some cloud service providers are in the following figure.

CHAPTER – 2

LITERATURE SURVEY

Title 2.1 : Water Level Monitoring and Management of Dams using IoT Author:
S. Janani¹, J. Joy Sing², L. Mayuri³, D. Mansur
Ali⁴

Dams are one of the major water sources for irrigation, electricity generation etc. in India. Dams play a vital role since the time of colonialism. Lack of proper dam management system have been causing several losses including the recent floods. Inspired by the existing rural and socio-economic problems, an innovative and feasible automatic control system can be developed for dam management purposes. This paper also proposes a novel idea of collecting and sharing real-time information about water levels to the people living nearby its bank. Highly precise water level monitoring system and timely report to the locality is also developed. When the water level crosses the threshold condition, alert messages will be sent to the people and the shutters will open automatically, retaining water to its normal level. Timely warnings to every person living in the locality and timely opening of shutters can thereby reduce the risks of loss of life and prevent disasters. Hence, automation of dam system using Arduino, ultrasonic sensor, GSM module and motor, creates a new eye for both the Government as well as the people in the locality for creating mitigation plans. Level controlling of water or liquid is a very active field where many papers have addressed the fuzzy or neural networks control in the water level control system. It requires measurement and control of the water-level.

One of the easiest way to measure water level is using submersible pressure transducers (wet sensors) which are easy to install and require very little maintenance. For the very reason, they are often used for temporary installations and installations in remote locations. They are supposed to be installed in a fixed position and should remain fully submersed at all times. It works on the concept of application of hydrostatic pressure to a strain gauge, which converts mechanical movement into an electrical signal which is in turn measured by the station data logger and converted into pressure, level and discharge.

As we see, now a days the safety control of large dams depends mainly on the measurement of some important quantities like absolute and relative displacements, strains and stresses in the concrete, discharges through the foundation, etc. and on visual inspections of the dam structures. In certain dams, the analysis of the measured data is compared with results of mathematical or physical models and is helpful in the structural safety assessment. Artificial neural networks (ANNs) provide a quick and flexible means of creating models for river flow prediction, and have been shown to perform well in comparison with conventional methods. These networks can be used for characterizing the normal structural behavior of the dams by taking into account the actions to which the structure is subject to in the past. An artificial neural network is nothing but an interconnected group of nodes, similar to the vast network of neurons in a brain. Each circular node of this network represents an artificial network and an arrow represents flow from the output of one node to the input of another.

A dam in its lifetime, can be exposed to significant water level variations and seasonal environmental temperature changes. The most important factor in water supplying is to supply the required water quantity while maintaining a water head above a minimum limit. It is required to deliver the necessary quantity of water with the adequate pressure to the final consumers. The overhead storage tanks are built so that the water level could be kept at a constant value to maintain that pressure. The demand of the consumers is changing throughout the day and that leads to change the output flow rate of the tank. If water is supplied at a constant rate either over flow of water or pressure drops at end user may happen. This leads to the necessity of water level management.

One such project was done on river Nile by establishing national geo referential databases and spatial layers along with hydro-meteorological parameters, water usage information, land use, extent of land cover and soil types. Present day monitoring technologies such as automatized weather stations and acoustic based Doppler current profilers were introduced. This sort of equipment is coherent for water flow measurement. In majority of the rivers the Doppler current profiler is mounted on a boat and operated from there.

This scraps the need for the construction of an expensive cableway. This project also constitutes two buoys to measure the extent of water evaporation on Lake Nasser in Egypt, serving as a means to check the ground truth for the satellite- based evaporation computations. Most of the basin countries have adopted this data structure.

Title 2.2 : Iot Based Dam Monitoring and Pre-Disaster Management Author: Noel Mathew Jacob¹, Vaishnavi Sreekumar², Ms. Sheenu P³

Dams play a vital role in harvesting energy and utilizing the energy for electrification and irrigation purposes. Apart from that dam protect againstflooding by collecting and holding waters when they reach a certain level. Once collected, a dam might be designed to release the water back into the river at a controlled speed or divert the water elsewhere for other uses. Due to unforeseensituations mismanagement of dams would lead to catastrophic damages, which is very evident in the case of 2018 Kerala floods, where 35 of its 54 dams were let open without prior warnings and early action plans leading to loss of lives, property damages etc. Majority of countries are still using manual systems for controlling and monitoring the dams which is time consuming, and inaccurate.

To solve this problem, an IoT based dam monitoring system and its role in pre disaster management is proposed. The dams are remotely monitoredusing real time data's such as temperature, water level, rainfall and water flow rate along with receiving danger warnings and alerts which can be set based onthe capacity of the dam as blue, orange or red alert through a mobile application.The dam operator is given the privilege to manually or automatically control the gates based on the scenarios and requirements. Similarly, 'n' number of dams can be monitored and operated which reduces the complexity in controlling or monitoring the dams and the data's collected can be studied for effective predictions in the future. Similarly, drought is also an integral part of disaster.

Title 2.3 : Smart IoT based Disaster Monitoring and Management System for Dams in Oman.

Author: Hajar Ali Saleh Alwahaibi 1, Syed Imran Ali Kazmi2, Muhammad Sohail Hayat3.

The research paper proposes “Smart IoT based Disaster Monitoring and Management System” in Oman Dams by integrating IoT devices, including water level sensor, Arduino and other complementary equipment. The idea of this research paper is the smart IoT system will collect all real time parameters and weather conditions all around the dam. The sensors will be all over the dam and connected to the Arduino that are responsible for collect the data and send to the nodeMCU which are connected with Arduino. Then the nodeMCU will transform the data to the cloud service and then will show in app for the employee in the dam. If there are any readings indicating a flood, the system will send SMS to the residents near the dam.

CHAPTER – 3 SYSTEM DESIGN

3.1 EXISTING SYSTEM :

The system is Sensor nodes, Local control room, Centre Control room. Sensory data collected from sensor nodes are sent to center control room through local control room. All the data from different local control rooms will bioanalyzed at center control room and corresponding action to be taken is decided by center room. Communication between sensor nodes and local control room is with Zigbee and in between local control room and center control room is with GSM module due to its high distance coverage.

3.2 Problem Statement :

- In the existing system is good means sensors sensing the data send to the local control room with the help of zig bee from there to local control room to central control room the data is transferred .
- The members present in the central control room collecting the data and verify form past previous data and send to their higher officials.
- The officials send the command to central control room open the dam gates or not .in this process is very time taking process

Disadvantages of Existing System

- It is the time taking process
- If any miscommunication occurs lot of damage occurs
- Decision takes long time

3.3 HARDWARE DESIGN OF THE SYSTEM :

The hardware design of the system mainly includes sensor node and network node. They are composed of wireless communication module, control and the related functional modules.

A. Sensor Node

The hardware structure of the sensor node mainly consists of three parts: waterlevel sensor, humidity and temperature sensor, rain fall sensor. All sensors are directly connected to Arduino.

B. Control and Communication Module

Control and communication module node consist of two parts, one is gate level control and one is GSM module. GSM module is used for sending messages to near by inhabitants. The control and communication module is the core unit which responsible for controlling dam and providing SMS with nearby peoples.

C. Network Node

The network node is the major module responsible for communicating hardware section with cloud. A Wi-Fi based microcontroller is used for the connectivity. Through this node data from hardware section transfers to cloud. This system uses Wi-Fi module (Esp8266) to send the sensor data to the cloud.

3.4 SOFTWARE DESIGN OF THE SYSTEM :

IoT has become an emerging research area because of need for connecting things, sensors and other smart technologies. Information related to physical objects can be immediately accessed by IoT and results into novel system having high efficiency and outputs. IoT offers a number of technologies like ubiquitous computing, RFIP, wireless sensor network, cloud computing. Cloud computing is a large-scale, low-cost processing unit and also an IP based connection mostly used for calculation and storage purpose. The utilization of cloud storage for our system is illustrated .

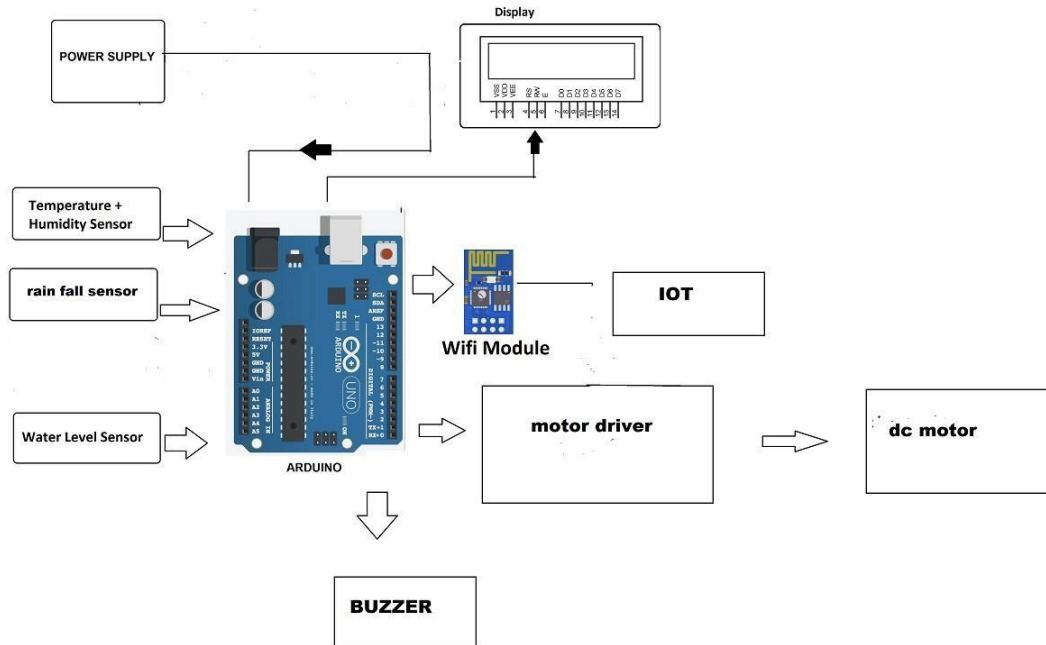


FIG 3.1 Model Diagram of Proposed System

A. Cloud Computing

Cloud Computing is the on demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to designate data centers available to many users over the Internet. Clouds may be limited to a single organization or may be available to many organizations or a combination of both.

B. Clouds Analytics

Cloud analytics is a service model in which elements of the data analytics process are provided through a public or private cloud. Cloud analytics applications and services are typically offered under a subscription-based pricing model.

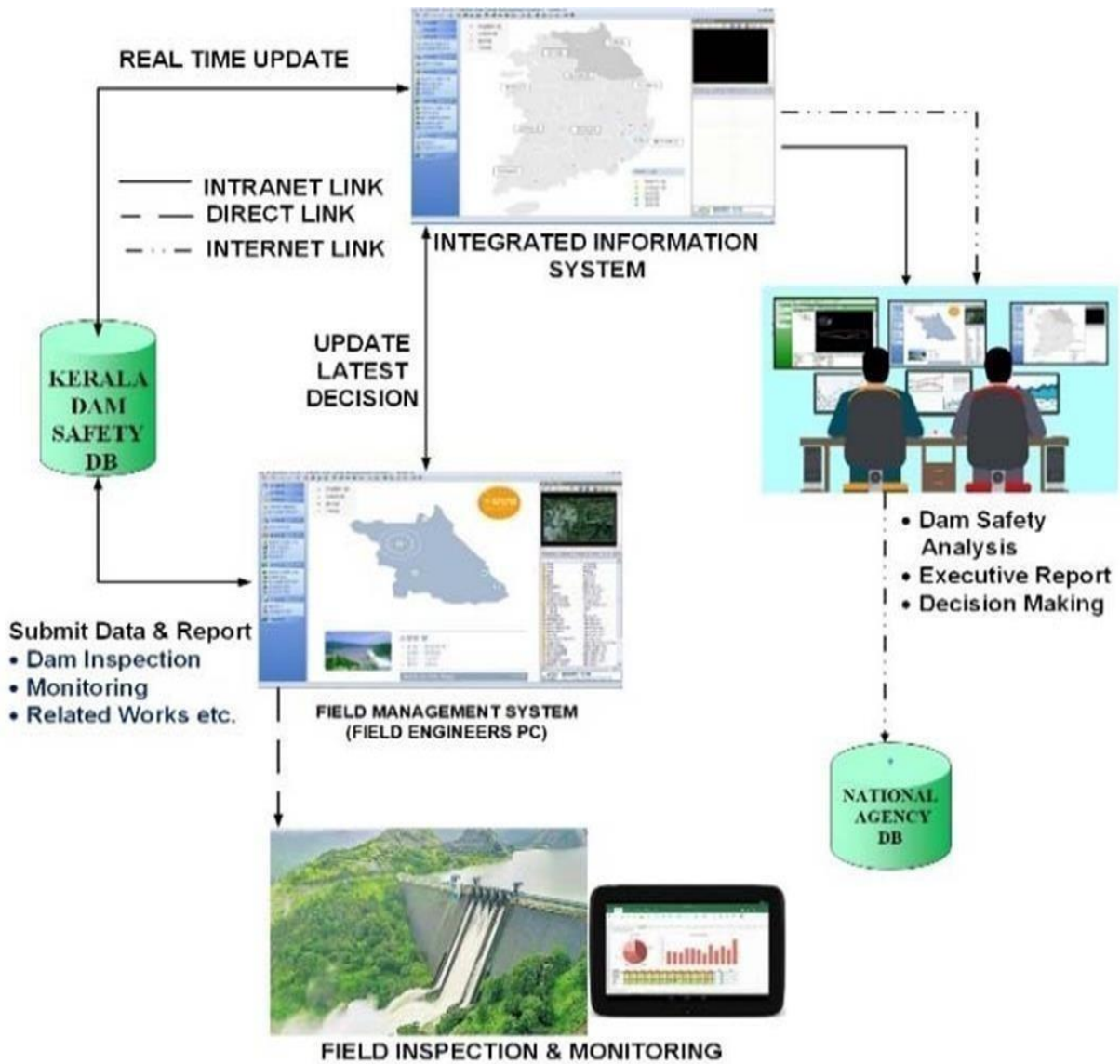


FIG 3.2 Project View in Cloud Operation

3.5 PROPOSED SYSTEM :

The hardware side consist of Arduino as the heart of the system with three sensors integrated to it for monitoring and control purposes. One MG996R servomotor are used for the control mechanism of gates of dam and can be varied at different step angles between 0° and 180°. DHT11 sensor is used to measure the temperature and humidity as they are vital parameters to monitor and predict adverse weather conditions. Rainfall interface is coupled with rainfall sensor to obtain the output between a scale of 0-100%. The Arduino is connected to the IoT platform via Wi-Fi.

The various sensors that are described above collect data and are given to the Arduino. The data received at the Arduino from the various sensors are then stored in the cloud. The data gathered from the sensor that are placed on various parts of the dam are sent to the Arduino which has got internet connection. These data are uploaded to the cloud by means of the Wi-Fi based microcontroller HUZAH. Arduino is an Opensource, Interactive, Programmable, Low cost, Simple, the ESP 8266 Wi-Fi SoC from Expressive Systems. The water level of the dam is calculated from various sensors and the message is to the Arduino. From that Arduino the data goes to the cloud with the help of Wi-Fi module and we can see the data in website (things peak) from that we can see the temperature, rainfall, level of the dam. If the level of the dam is abnormal in condition automatically the dam gates open up and the water will flow out, when the water reaches to the normal position the gates automatically will be closed.

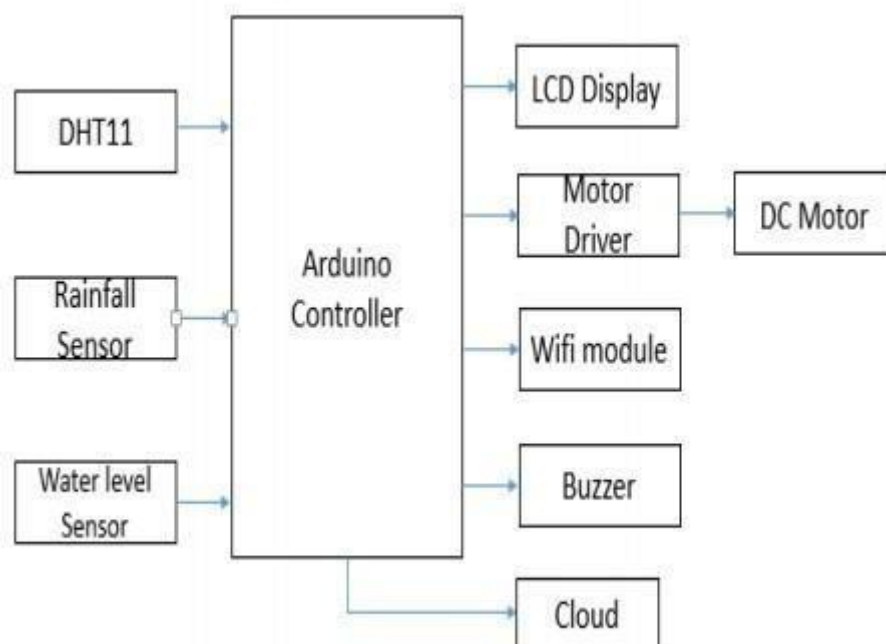


FIG 3.3 Block Diagram of Proposed System

CHAPTER – 4 PROJECT DESIGN

4.1 HARDWARE REQUIREMENTS :

- Arduino Controller
- DHT11
- Rainfall Sensor
- Water Level Sensor
- LCD Display
- Motor Driver
- DC Motor
- WIFI Module
- Buzzer

4.2 SOFTWARE REQUIREMENTS :

- Arduino IDE
- Thing Speak

4.3 HARDWARE EXPLANTION :

4.3.1 INTRODUCTION TO ARDUINO :

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason.

Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board -- you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

There are many varieties of Arduino boards that can be used for different purposes. Some boards look a bit different from the one below, but most Arduinos have the majority of these components in common:

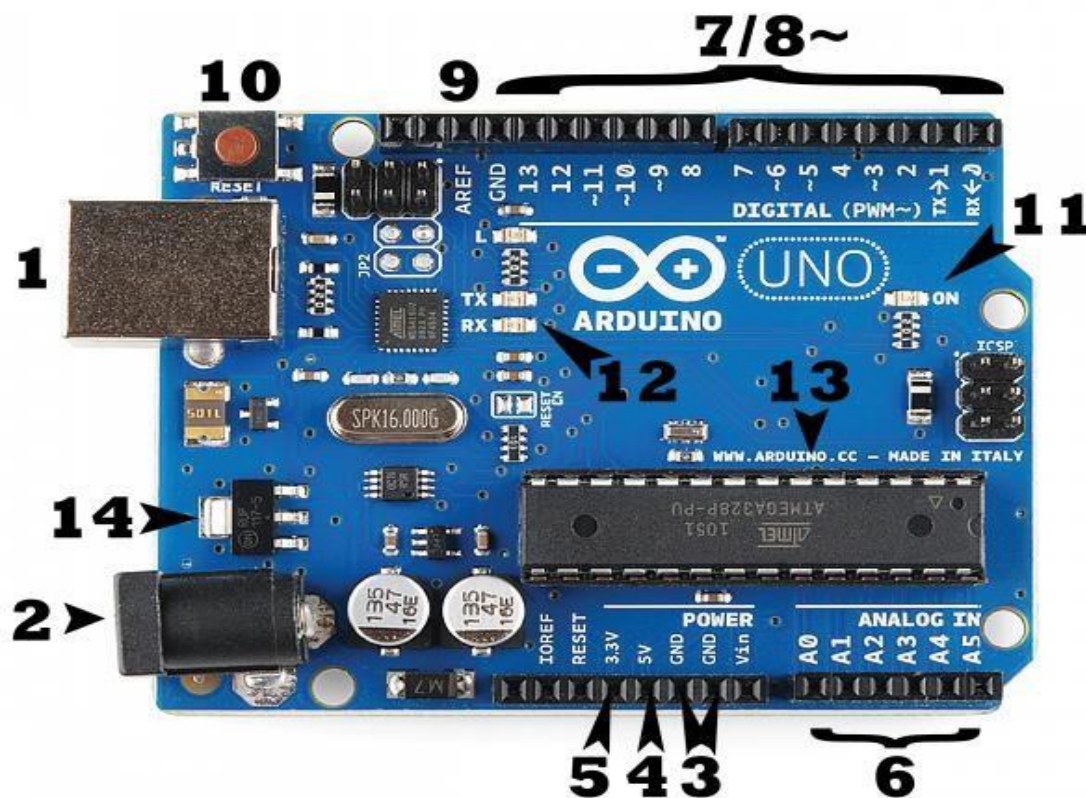


FIG 4.1 Arduino Uno

A. Power (USB / Barrel Jack)

Every Arduino board needs a way to be connected to a power source. The Arduino UNO can be powered from a USB cable coming from your computer or a wall power supply (like this) that is terminated in a barrel jack. In the picture above the USB connection is labeled **(1)** and the barrel jack is labeled **(2)**. The USB connection is also how you will load code onto your Arduino board. More on how to program with Arduino can be found in our Installing and Programming Arduino tutorial.

NOTE: Do NOT use a power supply greater than 20 Volts as you will overpower (and thereby destroy) your Arduino. The recommended voltage for most Arduino models is between 6 and 12 Volts.

B. Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)

The pins on your Arduino are the places where you connect wires to construct a circuit (probably in conjunction with a breadboard and some wire. They usually have black plastic 'headers' that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labeled on the board and used for different functions.

- **GND (3):** Short for 'Ground'. There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- **5V (4) & 3.3V (5):** As you might guess, the 5V pin supplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of the simple components used with the Arduino run happily off of 5 or 3.3 volts.
- **Analog (6):** The area of pins under the 'Analog In' label (A0 through A5 on the UNO) are Analog In pins. These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value that we can read.
- **Digital (7):** Across from the analog pins are the digital pins (0 through 13 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).
- **PWM (8):** You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). We have a

tutorial on PWM, but for now, think of these pins as being able to simulate analog output (like fading an LED in and out).

- **AREF (9):** Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

C. Reset Button

Just like the original Nintendo, the Arduino has a reset button **(10)**. Pushing it will temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code doesn't repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduino doesn't usually fix any problems.

D. Power LED Indicator

Just beneath and to the right of the word "UNO" on your circuit board, there's a tiny LED next to the word 'ON' **(11)**. This LED should light up whenever you plug your Arduino into a power source. If this light doesn't turn on, there's a good chance something is wrong. Time to re-check your circuit!

E. TX RX LEDs

TX is short for transmit, RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for serial communication. In our case, there are two places on the Arduino UNO where TX and RX appear -- once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs **(12)**. These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data (like when we're loading a new program onto the board).

F. Main IC

The black thing with all the metal legs is an IC, or Integrated Circuit **(13)**. Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the AT mega line of IC's from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software.

This information can usually be found in writing on the top side of the IC. If you want to know more about the difference between various IC's, reading the datasheets is often a good idea.

G. Voltage Regulator

The voltage regulator (**14**) is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it's for. The voltage regulator does exactly what it says -- it controls the amount of voltage that is let into the Arduino board. Think of it as a kind of gatekeeper; it will turn away an extra voltage that might harm the circuit. Of course, it has its limits, so don't hook up your Arduino to anything greater than 20 volts.

4.3.2 DHT11 Sensor :

Humidity is the measure of water vapor present in the air. The level of humidity in air affects various physical, chemical and biological processes. In industrial applications, humidity can affect the business cost of the products, health and safety of the employees. So, in semiconductor industries and control system industries measurement of humidity is very important. Humidity measurement determines the amount of moisture present in the gas that can be a mixture of water vapor, nitrogen, argon or pure gas etc.... Humidity sensors are of two types based on their measurement units. They are a relative humidity sensor and Absolute humidity sensor. DHT11 is a digital temperature and humidity sensor.

DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc.... to measure humidity and temperature instantaneously.

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.

Working of DHT11 Sensor :

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers. The temperature range of DHT11 is from 0 to 50 degree Celsius with a 2-degree accuracy. Humidity range of this sensor is from 20 to 80% with 5% accuracy. The sampling rate of this sensor is 1Hz .i.e. it gives one reading for every second. DHT11 is small in size with operating voltage from 3 to 5 volts. The maximum current used while measuring is 2.5mA.

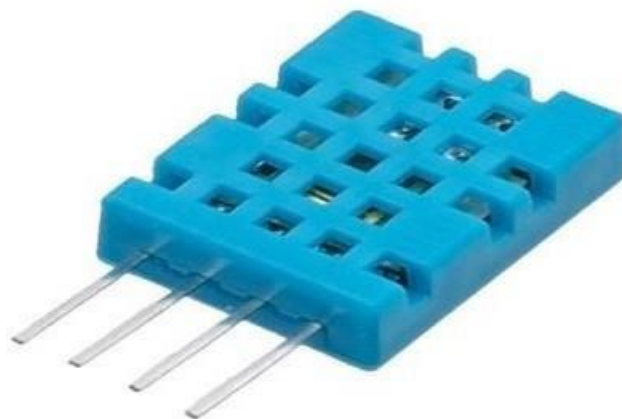


FIG 4.2 DHT11 Sensor

DHT11 sensor has four pins- VCC, GND, Data Pin and a not connected pin. A pull-up resistor of 5k to 10k ohms is provided for communication between sensor and micro-controller.

Application :

This sensor is used in various applications such as measuring humidity and temperature values in heating, ventilation and air conditioning systems. Weather stations also use these sensors to predict weather conditions. The humidity sensor is used as a preventive measure in homes where people are affected by humidity. Offices, cars, museums, greenhouses and industries use this sensor for measuring humidity values and as a safety measure.

4.3.3. Rainfall Sensor :

Nowadays, conserving water as well as its proper usage is essential in everyone's life. Here is a sensor namely rain sensor which is used to detect the rain and generate an alarm. So, we can conserve water to use it later for different purposes. There are several methods available for conserving water like harvesting, etc. Using this method we can increase the level of underground water. These sensors are mainly used in the field like automation, irrigation, automobiles, communication, etc. This article discusses a simple as well as reliable sensor module which can be available at low cost in the market.

A. What is a Rain Sensor?

A rain sensor is one kind of switching device which is used to detect the rainfall. It works like a switch and the working principle of this sensor is, whenever there is rain, the switch will be normally closed.

B. Rain Sensor Module

The rain sensor module/board is shown below. Basically, this board includes nickel coated lines and it works on the resistance principle. This sensor module permits to gauge moisture through analog output pins & it gives a digital output while moisture threshold surpasses.



FIG 4.3 Rain Sensor Module

This module is similar to the LM393 IC because it includes the electronic module as well as a PCB. Here PCB is used to collect the raindrops. When the rain falls on the board, then it creates a parallel resistance path to calculate through the operational amplifier. This sensor is a resistive dipole, and based on the moisture only it shows the resistance. For example, it shows more resistance when it is dry and shows less resistance when it is wet.

Pin Configuration :

The pin configuration of this sensor is shown below. This sensor includes four pins which include the following.

- Pin1 (VCC): It is a 5V DC pin
- Pin2 (GND): it is a GND (ground) pin
- Pin3 (DO): It is a low/ high output pin
- Pin4 (AO): It is an analog output pin

Specifications :

The specifications of the rain sensor include the following.

- This sensor module uses good quality of double-sided material.
- Anti-conductivity & oxidation with long time use
- The area of this sensor includes 5cm x 4cm and can be built with a nickel plate on the side



FIG 4.4 Rain Sensor

- The sensitivity can be adjusted by a potentiometer
- The required voltage is 5V
- The size of the small PCB is 3.2cm x 1.4cm
- For easy installation, it uses bolt holes
- It uses an LM393 comparator with wide voltage

Applications :

- This is used as a water preservation device and this is connected to the irrigation system to shut down the system in the event of rainfall.
- This sensor is used to guard the internal parts of an automobile against the rainfall as well as to support the regular windscreen wiper's mode.
- This sensor is used in specialized satellite communications aerials for activating a rain blower over the opening of the aerial feed, to get rid of water droplets from the mylar wrap to keep pressurized as well as dry air within the waveguides.

4.3.4 Water level Sensor :

This sensor can be used to measure the water level, monitor a sump pit, detect rainfall or detect leakage.

A. Hardware Overview :

The sensor has a series of ten exposed copper traces, five of which are power traces and five are sense traces.

These traces are interlaced so that there is one sense trace between every two power traces. Usually these traces are not connected but are bridged by water when submerged. There's a Power LED on the board which will light up when the board is powered.

B. How Water Level Sensor Works?

The working of the water level sensor is pretty straight forward. The series of exposed parallel conductors, together acts as a **variable resistor** (just like a potentiometer) whose resistance varies according to the water level. The change in resistance corresponds to the distance from the top of the sensor to the surface of the water.

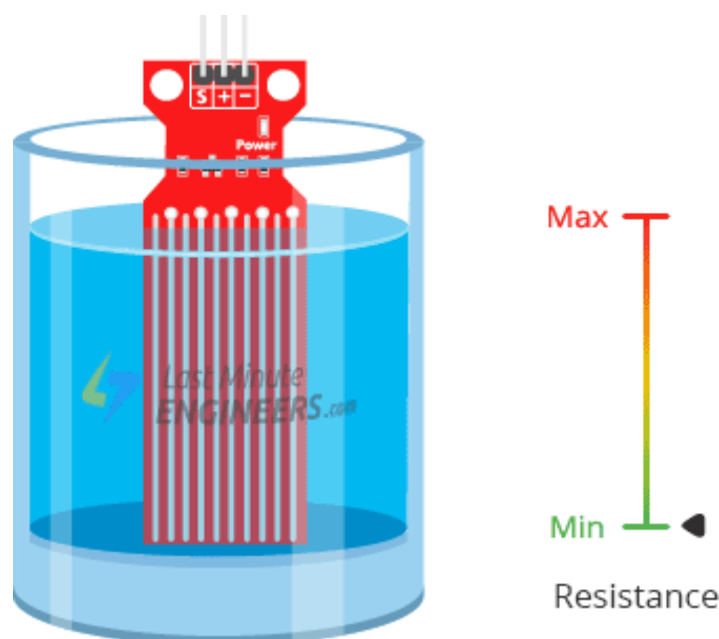


FIG 4.5 Water Level Sensor

The resistance is inversely proportional to the height of the water:

The more water the sensor is immersed in, results in better conductivity and will result in a lower resistance.

The less water the sensor is immersed in, results in poor conductivity and will result in a higher resistance.

The sensor produces an output voltage according to the resistance, which by measuring we can determine the water level.

C. Water Level Sensor Pinout :

The water level sensor is super easy to use and only has 3 pins to connect

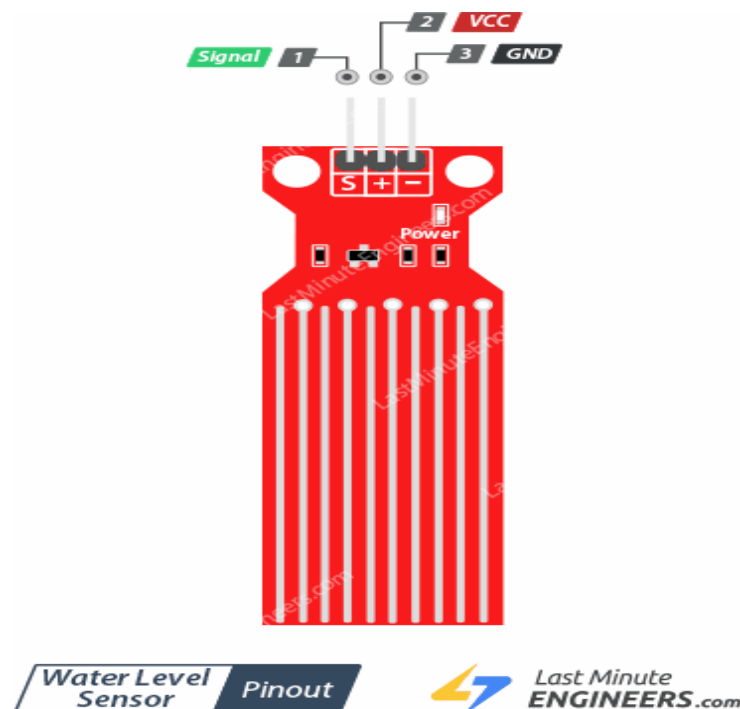


FIG 4.6 Water Level Sensor Pinout

S (Signal) pin is an analog output that will be connected to one of the analog inputs on your Arduino.

+ (VCC) pin supplies power for the sensor. It is recommended to power the sensor with between 3.3V – 5V. Please note that the analog output will vary depending on what voltage is provided for the sensor.

– (GND) is a ground connection.

4.3.5 LCD (Liquid Crystal Display) :

The Liquid Crystal library allows you to control LCD displays that are compatible with the Hitachi HD44780 driver. There are many of them out there, and you can usually tell them by the 16-pin interface.

The LCDs have a parallel interface, meaning that the microcontroller has to manipulate several interface pins at once to control the display. The interface consists of the following pins:



FIG 4.7 LCD Display

- A **register select (RS) pin** that controls where in the LCD's memory you're writing data to. You can select either the data register, which holds what goes on the screen, or an instruction register, which is where the LCD's controller looks for instructions on what to do next.
- A **Read/Write (R/W) pin** that selects reading mode or writing mode
- An **Enable pin** that enables writing to the registers
- 8 **data pins (D0 -D7)**. The states of these pins (high or low) are the bits that you're writing to a register when you write, or the values you're reading when you read.

There's also a **display contrast pin (Vo)**, **power supply pins (+5V and GND)** and **LED Backlight (Bkl+ and Bkl-)** pins that you can use to power the LCD, control the display contrast, and turn on and off the LED backlight, respectively. The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register. The Liquid Crystal Library simplifies this for you so you don't need to know the low-level instructions.

The Hitachi-compatible LCDs can be controlled in two modes: 4-bit or 8-bit. The 4-bit mode requires seven I/O pins from the Arduino, while the 8-bit mode requires 11 pins. For displaying text on the screen, you can do most everything in 4-bit mode, so example shows how to control a 16x2 LCD in 4-bit mode.

Before wiring the LCD screen to your Arduino board we suggest to solder a pin header strip to the 14 (or 16) pin count connector of the LCD screen, as you can see in the image further up. To wire your LCD screen to your board, connect the following pins:

- LCD RS pin to digital pin 12
- LCD Enable pin to digital pin 11
- LCD D4 pin to digital pin 5
- LCD D5 pin to digital pin 4
- LCD D6 pin to digital pin 3
- LCD D7 pin to digital pin 2
- LCD R/W pin to GND
- LCD VSS pin to GND
- LCD VCC pin to 5V
- LCD LED+ to 5V through a 220 ohm resistor
- LCD LED- to GND

Additionally, wire a 10k potentiometer to +5V and GND, with its wiper (output) to LCD screen's VO pin (pin 3).

4.3.6 Motor Driver :

Motor drives are circuits used to run a motor. In other words, they are commonly used for motor interfacing. These drive circuits can be easily interfaced with the motor and their selection depends upon the type of motor being used and their ratings (current, voltage).

Major Components in Motor Drives :

- For DC Motors the major motor drive components for DC motors are: a controller, a motor driver IC or a motor driver circuit, the desired DC motor being used, power supply unit and the necessary connections to the motor.
1. Controller: The controller can be a microprocessor or a microcontroller.
 2. Motor Driver IC or Motor Driver Circuits: They are basically current amplifiers which accept the low current signal from the controller and convert it into a high current signal which helps to drive the motor.
 3. Motor: Motor is defined as an electric or mechanic device that can create a motion. While interfacing with the controller; some of the motors like DC motor, stepper motor and brushless dc motor may require a driver IC or driver circuit. DC motor is a type of motor that can convert DC into a mechanical power. In a brushless DC motor, it consists of a DC power source, an inverter producing an AC signal to drive the motor. While stepper motor is a brushless DC electric motor that converts electrical pulses into discrete mechanical motions.
 4. Power Supply Unit: Provides the required power to the motor drive.

DC Motor Driver Circuits :

Motor Driver circuits are current amplifiers. They act as a bridge between the controller and the motor in a motor drive. Motor drivers are made from discrete components which are integrated inside an IC. The input to the motor driver IC or motor driver circuit is a low current signal. The function of the circuit is to convert the low current signal to a high current signal. This high current signal is then given to the motor. The motor can be a brushless DC motor, brushed DC motor, stepper motor, other DC motors etc.

Features :

- High level functionality.
- Better performance.
- Provides high voltage.
- Provides high current drive.
- Includes protection schemes to prevent the failure of motors due to any faults.

Need for Motor Driver Circuits/ICs :

In motor interfacing with controllers, primary requirement for the operation of the controller is low voltage and small amount of current. But the motors require a high voltage and current for its operation. In other words we can say the output of the controller or processor is not enough to drive a motor. In such a case direct interfacing of controllers to the motor is not possible. So we use a Motor Driver Circuit or Motor Driver IC.

Not only in the case of controllers, while connecting motors with 555 timer ICs or 74 series ICs; they also cannot provide the large current required by the motor. If direct connection is given, there might be a chance of damage to the IC.

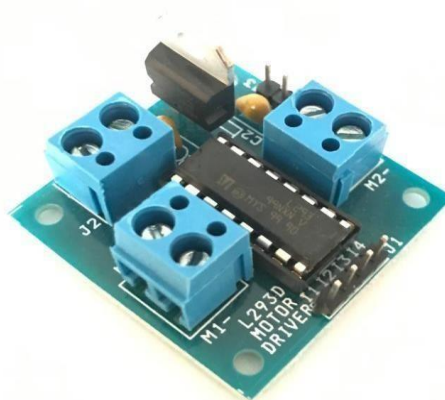


FIG 4.8 Motor Drive

4.3.7 DC MOTOR :

A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors were the first form of motors widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor, a lightweight brushed motor used for portable power tools and appliances can operate on direct current and alternating current. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

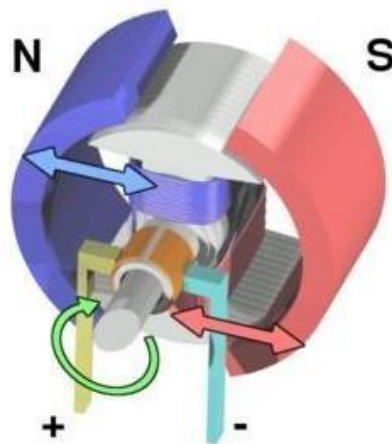


FIG 4.9 Electric Motor Cycle

A. Electromagnetic Motors :

A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current.

A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have multiple turns around the core, and in large motors there can be several parallel current paths. The ends of the wire winding are connected to a commutator. The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through brushes. (Brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes.)

The total amount of current sent to the coil, the coil's size, and what it is wrapped around decide the strength of the electromagnetic field created. The sequence of turning a particular coil on or off dictates what direction the effective electromagnetic fields are pointed. By turning on and off coils in sequence, a rotating magnetic field can be created. These rotating magnetic fields interact with the magnetic fields of the magnets (permanent or electromagnets) in the stationary part of the motor (stator) to create a torque on the armature which causes it to rotate. In some DC motor designs, the stator fields use electromagnets to create their magnetic fields which allows greater control over the motor. At high power levels, DC motors are almost always cooled using forced air.

Different number of stator and armature fields as well as how they are connected provide different inherent speed and torque regulation characteristics. The speed of a DC motor can be controlled by changing the voltage applied to the armature. Variable resistance in the armature circuit or field circuit allows speed control. Modern DC motors are often controlled by power electronics systems which adjust the voltage by "chopping" the DC current into on and off cycles which have an effective lower voltage. Since the series-wound DC motor develops its highest torque at low speed, it is often used in traction applications such as electric locomotives, and trams. The DC motor was the mainstay of electric traction drives on both electric and diesel-electric locomotives, street-cars/trams and diesel electric drilling rigs for many years. The introduction of DC motors and an electrical grid system to run machinery starting in the 1870s started a new second Industrial Revolution.

DC motors can operate directly from rechargeable batteries, providing the motive power for the first electric vehicles and today's hybrid cars and electric cars as well as driving a host of cordless tools. Today DC motors are still found in applications as small as toys and disk drives, or in large sizes to operate steel rolling mills and paper machines. Large DC motors with separately excited fields were generally used with winder drives for mine hoists, for high torque as well as smooth speed control using thyristor drives. These are now replaced with large AC motors with variable frequency drives. If external mechanical power is applied to a DC motor it acts as a DC generator, a dynamo. This feature is used to slow down and recharge batteries on hybrid and electric cars or to return electricity back to the electric grid used on a street car or electric powered train line when they slow down. This process is called regenerative braking on hybrid and electric cars. In diesel electric locomotives they also use their DC motors as generators to slow down but dissipate the energy in resistor stacks. Newer designs are adding large battery packs to recapture some of this energy.

B. Brushed :

The brushed DC electric motor generates torque directly from DC power supplied to the motor by using internal commutation, stationary magnets (permanent or electromagnets), and rotating electromagnets. Advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed. Disadvantages are high maintenance and low life-span for high intensity uses. Maintenance involves regularly replacing the carbon brushes and springs which carry the electric current, as well as cleaning or replacing the commutator. These components are necessary for transferring electrical power from outside the motor to the spinning wire windings of the rotor inside the motor.

Brushes are usually made of graphite or carbon, sometimes with added dispersed copper to improve conductivity. In use, the soft brush material wears to fit the diameter of the commutator, and continues to wear. A brush holder has a spring to maintain pressure on the brush as it shortens. For brushes intended to carry more than an ampere or two, a flying lead will be molded into the brush and connected to the motor terminals.

Very small brushes may rely on sliding contact with a metal brush holder to carry current into the brush, or may rely on a contact spring pressing on the end of the brush. The brushes in very small, short-lived motors, such as are used in toys, may be made of a folded strip of metal that contacts the commutator. The brushes in very small, short-lived motors, such as are used in toys, may be made of a folded strip of metal that contacts the commutator.

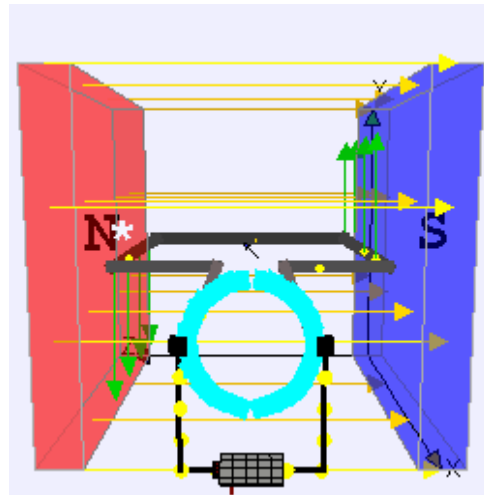


FIG 4.10 Motor With Brush

C. Brushless:

Typical brushless DC motors use one or more permanent magnets in the rotor and electromagnets on the motor housing for the stator. A motor controller converts DC to AC. This design is mechanically simpler than that of brushed motors because it eliminates the complication of transferring power from outside the motor to the spinning rotor. The motor controller can sense the rotor's position via Hall effect sensors or similar devices and can precisely control the timing, phase, etc., of the current in the rotor coils to optimize torque, conserve power, regulate speed, and even apply some braking. Advantages of brushless motors include long life span, little or no maintenance, and high efficiency. Disadvantages include high initial cost, and more complicated motor speed controllers. Some such brushless motors are sometimes referred to as "synchronous motors" although they have no external power supply to be synchronized with, as would be the case with normal AC synchronous motors.



FIG 4.11 DC Motor

4.3.8 WIFI Module :

In 2014, an ESP8266 Wi-Fi module was introduced and developed by third-party manufacturers like AI thinkers, which is mainly utilized for IoT-based embedded applications development. It is capable of handling various functions of the Wi-Fi network from another application processor. It is a SOC (System On-chip) integrated with a TCP/IP protocol stack, which can provide microcontroller access to any type of Wi-Fi network. This article deals with the pin configuration, specifications, circuit diagram, applications, and alternatives of the ESP8266 Wi-Fi module.

A. What is the ESP8266 Wi-Fi Module?

An ESP8266 Wi-Fi module is a SOC microchip mainly used for the development of end-point IoT (Internet of things) applications. It is referred to as a standalone wireless transceiver, available at a very low price. It is used to enable the internet connection to various applications of embedded systems.

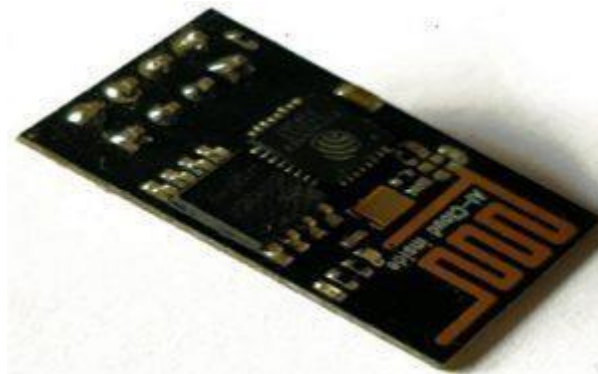


FIG 4.12 ESP8266 Wi-Fi Module

If systems designed the ESP8266 Wi-Fi module to support both the TCP/IP capability and the microcontroller access to any Wi-Fi network. It provides the solutions to meet the requirements of industries of IoT such as cost, power, performance, and design. It can work as either a slave or a standalone application. If the ESP8266 Wi-Fi runs as a slave to a microcontroller host, then it can be used as a Wi-Fi adaptor to any type of microcontroller using UART or SPI. If the module is used as a standalone application, then it provides the functions of the microcontroller and Wi-Fi network.

The ESP8266 Wi-Fi module is highly integrated with RF balun, power modules, RF transmitter and receiver, analog transmitter and receiver, amplifiers, filters, digital baseband, power modules, external circuitry, and other necessary components. The ESP8266 Wi-Fi module is a microchip shown in the figure below. A set of AT commands are needed by the microcontroller to communicate with the ESP8266 Wi-Fi module. Hence it is developed with AT commands software to allow the Arduino Wi-Fi functionalities, and also allows loading various software to design the own application on the memory and processor of the module. The processor of this module is based on the Ten silica Extensa Diamond Standard 106 micro and operates easily at 80 MHz. There are different types of ESP modules designed by third-party manufacturers. They are,

- ESP8266-01 designed with 8 pins (GPIO pins -2)
- ESP8266-02 designed with 8 pins (GPIO pins -3)
- ESP8266-03 designed with 14 pins (GPIO pins- 7)
- ESP8266-04 designed with 14 pins (GPIO pins- 7)

4.4 SOFTWARE EXPLANTION :

4.4.1 Arduino IDE :

The **Arduino Integrated Development Environment** - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

The offline IDE **makes it easy to write code and upload it to the board without an Internet connection**. The Arduino Software (IDE) makes it easy to write code and upload it to the board offline. We recommend it for users with poor or no internet connection. This software can be used with any Arduino board.



FIG 4.13 Arduino IDE

4.4.2 ThingSpeak :

ThingSpeak is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. ThingSpeak was originally launched by io Bridge in 2010 as a service in support of IoT applications.

ThingSpeak has integrated support from the numerical computing software MATLAB from MathWorks, allowing ThingSpeak users to analyze and visualize uploaded data using MATLAB without requiring the purchase of a MATLAB license from MathWorks.

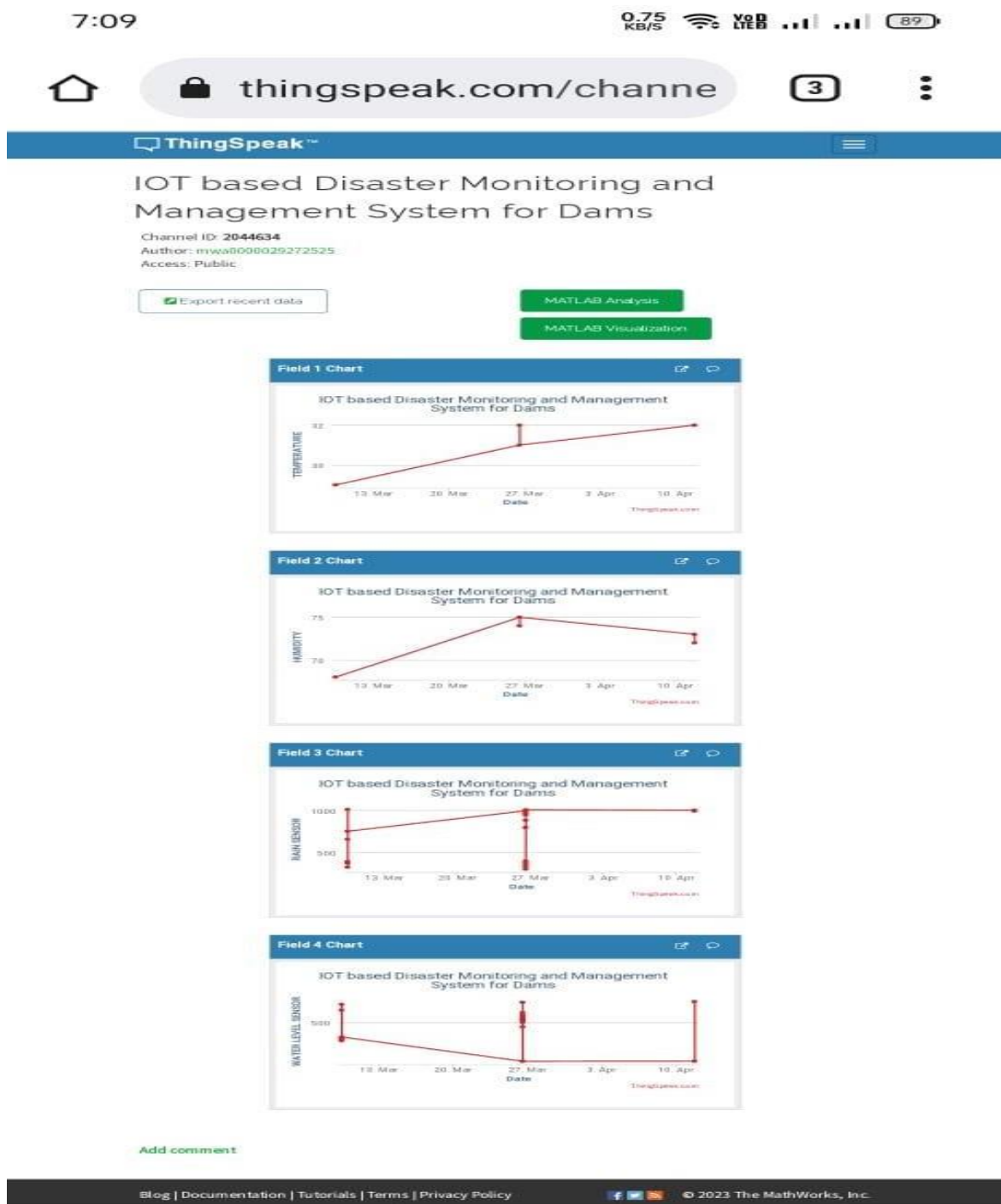


FIG 4.14 ThingSpeak Data

CHAPTER – 5

CONCLUSION

5.1 CONCLUSION :

The conventional dam monitoring system is by physical means. In order to solve the issues related to manual monitoring and control, we have designed an IoT based disaster monitoring and management system for dams. In this system we make use of different sensors for real time monitoring of data. These are sent to the cloud server via WIFI module ESP8266 for monitoring and control. The proposed system will be helpful to solve all the water related problems. The system also sends messages for public safety. Thus, our proposed system can effectively manage dams and prevent a disaster.

5.2 FUTURE SCOPE :

The system is capable of incorporating more dams that may be constructed in near future. In future a new application can be developed in which the people can easily access and find spots which are prone to flooding or in areas where flood may occur with the help of Google maps. This helps people to avoid the places which are in the verge of flooding. This system can also be extended to a complete disaster management system by combining all major natural disasters like landslides, earthquakes.

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APPENDIX

A. IEEE Standards Activities in the Internet of Things (IoT)

IEEE serves as the gathering place for the global technical community working on the Internet of Things (IoT), as demonstrated by the many ongoing activities of the IEEE Internet of Things Initiative. The IEEE IoT Initiative provides the platform where professionals learn, share knowledge, and collaborate on the sweeping convergence of technologies, markets, applications, and the Internet. The success of IoT depends strongly on standardization, which provides interoperability, compatibility, reliability, and effective operations on a global scale.

IEEE has a number of existing standards (current and under development), activities, and events that are directly related to creating the environment needed for a vibrant IoT, recognizing the value of the IoT to industry and the benefits this technology innovation brings to the public. Some key standards activities are:

- **Architectural framework:** The focus of IEEE P2413-2019 is to develop a standard for the architectural framework for the Internet of Things, which includes descriptions of various IoT domains, definitions of IoT domain abstractions, and identification of commonalities between different IoT domains. The architectural framework defined in this standard will promote cross domain interaction, aid system interoperability and functional compatibility.
- **Harmonization and security of IoT:** The IEEE 1451-99 is focused on developing a standard for harmonization of Internet of Things (IoT) devices and systems. This standard defines a method for data sharing, interoperability, and security of messages over a network, where sensors, actuators and other devices can interoperate, regardless of underlying communication technology.
- **Sensor Performance and Quality:** Sensors are fundamental to IoT ecosystem with large volume of different sensors integrated into a complex framework. IEEE 2700 proposes a common framework for sensor performance specification terminology, units, conditions and limits is provided. IEEE P2510 defines quality measures, controls, parameters and definitions for sensor data related to Internet of Things (IoT) implementations.

B. SOURCE CODE

```
/*
 * HOTSPOT ID:TEST1236 PA:test1236 https://thingspeak.com/channels/2044634
 */
#include <ESP8266WiFi.h>
#include <LiquidCrystal.h> // Include LiquidCrystal Library
#include <dht.h>

#define outPin 2
int buzzer=5;
int MF=6;
int MB=7;
LiquidCrystal lcd(8, 9, 10, 11, 12, 13); // Create an LCD object.
dht DHT; // Create a DHT object
unsigned int RAIN,WATER;

void setup() {
  lcd.begin(16,2); // Initialize the LCD
  Serial.begin(115200);
  pinMode(buzzer,OUTPUT);
  pinMode(MF,OUTPUT);
  pinMode(MB,OUTPUT);
  digitalWrite(buzzer, LOW);
  digitalWrite(MF, HIGH);
  digitalWrite(MB, HIGH);
  lcd.clear();
  lcd.print("IOT BASED ");
  lcd.setCursor(0,1);
  lcd.print("DISASTER MNTR");
  delay(3000);
  lcd.print(" AND MANAGEMENT ");
  lcd.setCursor(0,1);
  lcd.print("SYSTEM FOR DAMS");
  delay(2000);
}

void loop() {
  int readData = DHT.read11(outPin);
  int t = DHT.temperature;
  int h = DHT.humidity;
  RAIN=analogRead(A0);
  WATER=analogRead(A1);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("T:");
  lcd.print(t);
  lcd.setCursor(7,0);
  lcd.print("H:");
  lcd.print(h);

  lcd.setCursor(0,1);
```

```

lcd.print("R:");
lcd.print(RAIN);
lcd.setCursor(8,1);
lcd.print("W:");
lcd.print(WATER);
if(RAIN>900)
{
  lcd.clear();
  lcd.print("NO RAIN FALL ");
}
if(RAIN<=800)
{
  lcd.clear();
  lcd.print("IT'S RAINY ");
}
if(WATER<100)
{
  lcd.setCursor(0,1);
  lcd.print("DAM LEVEL:EMPTY ");
  delay(1000);
}
if(WATER>100&&WATER<600)
{
  lcd.setCursor(0,1);
  lcd.print("DAM LEVEL:LOW ");
  delay(1000);
}
if(WATER>600&&WATER<675)
{
  lcd.setCursor(0,1);
  lcd.print("DAM LEVEL:MEDIUM ");
  delay(1000);
}
if(WATER>675)
{
  digitalWrite(buzzer, HIGH);
  lcd.setCursor(0,1);
  lcd.print("DAM LEVEL:FULL ");
  digitalWrite(MF, HIGH);
  digitalWrite(MB, LOW);
  delay(1000);
}
if(!(WATER>675)){
  digitalWrite(buzzer, LOW);
  digitalWrite(MF, HIGH);
  digitalWrite(MB, HIGH);

}
lcd.clear();
  lcd.print("SENDING DATA");
Serial.write("AT+CIPSTART=\"TCP\",184.106.153.149\",80");

```

```
        delay(2000);
        digitalWrite(buzzer, LOW);
        Serial.write("AT+CIPSEND=122\r\n");
        delay(1000);
        Serial.write("GET /update?api_key=DM50XM1FBK3FWGYK&field1=");
        delay(1000);
        Serial.print(t);
        Serial.write("&field2=");
        Serial.print(h);
        delay(500);
        Serial.write("&field3=");
        Serial.print(RAIN);
        delay(500);
        Serial.write("&field4=");
        Serial.print(WATER);
        lcd.clear();
        lcd.print("SENT DATA");
    }
```

C. PROJECT SCREEN SHORT

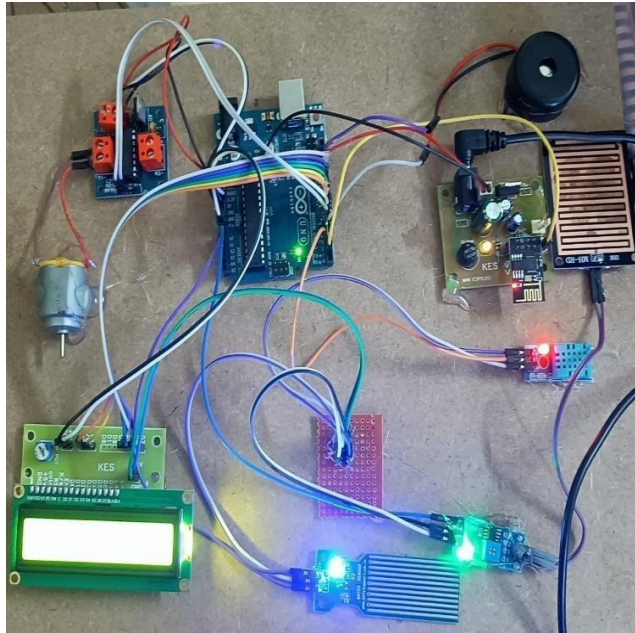


FIG Hardware Setup